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FISH CREEK RESERVOIR EXPANSION

FINAL ENVIRONMENTAL IMPACT STATEMENT



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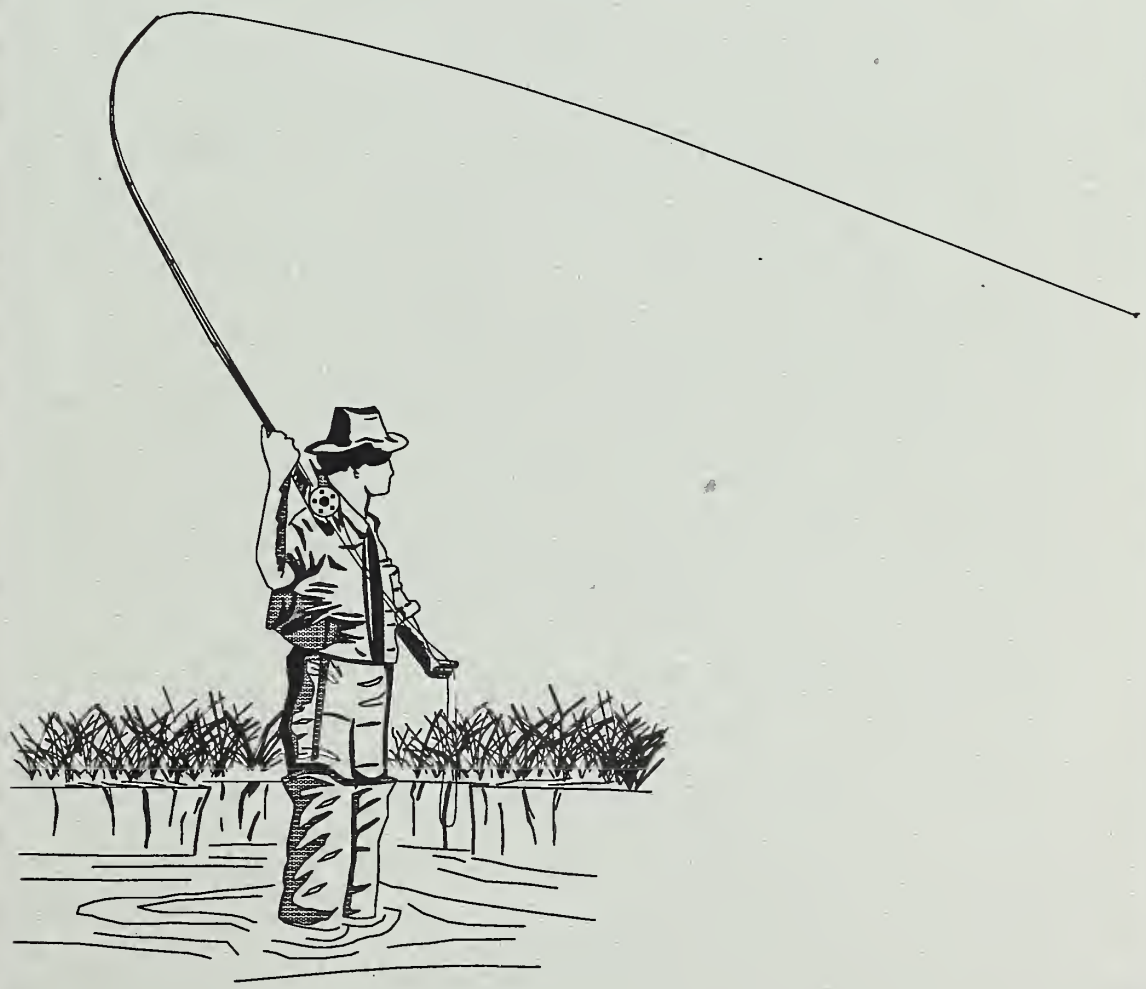
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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED FISH CREEK RESERVOIR EXPANSION ROUTT COUNTY, COLORADO

Lead Agency:	USDA - Forest Service Routt National Forest, Steamboat Springs, Colorado
Reviewing Agencies:	U.S. Fish & Wildlife Service U.S. Army Corps of Engineers U.S. Environmental Protection Agency Colorado Department of Health - Water Quality Control Division Colorado Department of Natural Resources Colorado State Historic Preservation Office Colorado Division of Wildlife Routt County
Responsible Official:	Jerry E. Schmidt, Forest Supervisor Routt National Forest
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ABSTRACT: The City of Steamboat Springs, in partnership with the Mt. Werner Water and Sanitation District, is proposing to enlarge the existing Fish Creek Reservoir, located on the Routt National Forest in Steamboat Springs, Colorado. Fish Creek Reservoir is a municipal water supply and is operated by the City under a Forest Service Special Use Permit. The Proposed Action, Alternative B, includes enlargement of the reservoir's water storage capacity from 1,842 acre-feet (AF) to 4,122 AF by raising the level of the main dam approximately 20 feet and reconstructing the saddle dam and spillway. Also proposed are the installation of an early warning system on both dams, and an underground powerline as the principal power source for the early warning system and remote off-site operations control. Two other alternatives were analyzed in detail: No Action (Alternative A), and a smaller reservoir expansion (Alternative C). In addition, three other alternatives that would be available to the City and Mt. Werner are displayed: Water Conservation, Infiltration Gallery Expansion, and a Combination Alternative consisting of Water Conservation, Infiltration Gallery Expansion and Fish Creek Reservoir Modernization. At this time, considering the environmental impacts to public lands and the opportunities for use of those lands which would benefit the most people over the longest term, the Forest Supervisor prefers Alternative B. The U.S. Army Corps of Engineers will also make a decision concerning the issuance of a permit as is required under Section 404 of the *Clean Water Act, 1977.*

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

BACKGROUND

In February 1992, representatives of the City of Steamboat Springs (City) and Mt. Werner Water and Sanitation District (Mt. Werner) met with the U.S. Forest Service (Forest Service) to discuss the potential expansion and modernization of the Fish Creek Reservoir. Mt. Werner, having no water storage capacity is seeking to enlarge the reservoir, in partnership with the City, to create water storage capacity to meet Mt. Werner's immediate water storage needs. The City would also benefit by having an upgraded facility and more water storage capacity to meet its long-term water demands. Both the City and Mt. Werner provide water service to residents of the City of Steamboat Springs. The Forest Service, recognizing the City as the existing Special Use Permittee for the reservoir, encouraged the two water providers to submit a joint application for the expansion proposal, wherein the City would be the main applicant. This would avoid the possibility of the Forest Service having to administer two separate permits on the same reservoir. Consequently, the City, in partnership with Mt. Werner, submitted a Special Use Application to the Hahns Peak District of the Routt National Forest, Steamboat Springs, Colorado in February 1992.

The City and Mt. Werner are proposing to enlarge the Fish Creek Reservoir by raising the height of the existing main dam 20 feet, reconstructing and raising the saddle dam, and creating a new spillway channel. The proposal provides for an increase in storage capacity of 2,280 acre-feet (AF), from 1,842 to 4,122 AF. Fifty acres of shoreline would be inundated, changing the present size of the reservoir from 90 acres to 140 acres. Also included in the expansion proposal is the installation of an early warning monitoring system, and the development of a remote, off-site management system for the operation of the reservoir. An electrical underground powerline, stemming from an existing powerline on Buffalo Pass, is being proposed to provide power for the remote operation of the dam outlet structure and the early warning monitoring system. The construction activities associated with the proposal would take two summer construction seasons to complete. The City and Mt. Werner are referred to collectively hereafter as the "Applicant" and their proposal is referred to as the "Proposed Action".

The purpose of and need for the Proposed Action is as follows:

Purpose: To provide a high quality, cost-effective, and reliable water supply to meet the immediate water storage needs of Mt. Werner and to meet the long-term municipal water demands of residents of both the City and Mt. Werner water service areas.

Need: Mt. Werner's existing water demands exceed its direct flow water rights in Fish Creek. Consequently, Mt. Werner borrows storage water from the Fish Creek Reservoir to meet its service area demands. The City presently has sufficient water storage capacity for its service area water demands, but additional storage is needed to meet projected long-term water needs.

In 1981, the City began planning for its long-term water needs. These planning efforts identified the need for 2,000 acre feet (AF) of additional reservoir storage capacity and recommended the Fish Creek Reservoir expansion as the most cost-effective way of achieving this goal. Also recommended was the construction of a 5.0 million gallon per day (MGD) water filtration plant on Fish Creek. Additionally, the development of an infiltration gallery along the Yampa River was identified in the City's plan as a means of providing peaking capacity and a point of redundancy to the water system. The infiltration gallery could deliver treated water into the distribution system in the event of failure

in the Fish Creek supply and/or filtration system. Of these three recommendations, the planning efforts identified the filtration plant as the most urgently needed, followed by the development of the infiltration gallery, and finally, the Fish Creek Reservoir enlargement.

In 1980, the City applied for, and received, a conditional water right decree for 2,000 AF of water storage in the Fish Creek Reservoir. In 1985, the City completed a 3.0 MGD enlargement of Mt. Werner's water filtration facility on Fish Creek. In 1989, the City acquired an 80-acre site for the proposed infiltration gallery and in 1991, the City completed work on the infiltration gallery. The expansion of the Fish Creek Reservoir is the remaining element of the City's 1981 water planning efforts.

In addition to Mt. Werner's immediate need for water storage, the City and Mt. Werner considered other economic and environmental factors in determining why it would be in the community's best interest to expand the reservoir at this time. These factors include:

- Present day interest rates are extremely favorable and are at a historic low. Taking advantage of these rates would result in significant savings to the taxpayer.

- Both the City and Mt. Werner are in a position to financially and technically undertake the six million dollar proposed expansion at this time. The Steamboat Springs City Council passed a resolution approving a financial arrangement for the expansion of the reservoir if the Forest Service selects the Proposed Action after analysis.

- Fish Creek Reservoir is an existing facility. No undisturbed site would have to be impacted to increase municipal water supply.

- Due to the design and operation of the existing reservoir, environmental damage is occurring to the Puppy Dog Lake channel, located below the spillway of the Fish Creek Reservoir. Prior to construction of the reservoir, most of the spring runoff flow was naturally channelized through the Middle Fork of Fish Creek. Presently, however, high spring runoff flows are released through the spillway to Puppy Dog Lake and its drainage channel. This is occurring because the main dam outlet is not large enough to carry these seasonal flows to the Middle Fork of Fish Creek. Consequently, the increased flow, and subsequent erosional process, has caused the natural Puppy Dog Lake channel to change dramatically. The proposed project would re-establish the natural flow regime and most of the spring runoff flow would be carried through a larger outlet structure in the main dam to the Middle Fork of Fish Creek. Runoff flow through the spillway and the Puppy Dog Lake channel would therefore be minimized, allowing for the rehabilitation of the channel.

- It would be less environmentally damaging to expand the reservoir at this time because the reservoir could be drained during construction activities without causing a serious water shortage to the residents of Steamboat Springs. An upstream (inside) raise of the dam could be accomplished which would minimize impacts to the environment. If the reservoir expansion is delayed, water demands in the future would prevent draining the reservoir during the construction period. Consequently, this delay would result in a downstream (outside) raise of the dam,

which would be more costly and cause greater impacts to the area, particularly in terms of wetlands loss.

Included in the expansion proposal are several modernization elements which would improve the facility from a public safety standpoint and add to the efficiency of the water delivery system. They include:

- An early warning alarm system for both the main and saddle dams
- Remote, off-site operational control of the reservoir
- An electric power line as a reliable energy source

Other benefits include:

- Guaranteed releases to maintain in-stream flow rights and enhance in-stream flows
- A fisheries pool to maintain viable fish populations and maintain the recreational opportunities at the reservoir
- The redesign and relocation of Granite Campground
- Control of flows through Puppy Dog Lake and subsequent rehabilitation of the channel

The *Routt National Forest Land and Resource Management Plan, 1983* (Forest Plan) identifies the Fish Creek Reservoir, and the area surrounding the reservoir, as a 10E management prescription area. The "10E" land management prescription provides for the management of municipal and supply watersheds. The purpose of and need for the Proposed Action is consistent with the Forest Plan, as are the alternatives identified and described in subsequent sections.

THE AFFECTED ENVIRONMENT

Fish Creek Reservoir is located on the Routt National Forest, four miles south of Buffalo Pass, in Routt County, Colorado. Fish Creek and Fish Creek Reservoir serve as the primary municipal water supplies for both the City and Mt. Werner. The reservoir presently covers approximately 90 surface acres and has a water storage capacity of approximately 1,842 AF. The reservoir has two earthen dams, the main dam and a saddle dam. Both dams are classified by the State as "Class A, High Hazard", since dam failure could cause extensive property damage, and possibly, the loss of life. During spring runoff and high flow periods, a spillway routes water through a small lake, called Puppy Dog Lake, located below the saddle dam. The reservoir is operated manually, on-site by City personnel. Operation of the dam is limited seasonally, due to difficult accessibility caused by heavy snowfall.

The Upper Middle Fork of Fish Creek and Granite Creek provide water to the Fish Creek Reservoir. Access to the reservoir is seasonally limited and generally takes place during July through October of each year. Recreation activities at the reservoir, and within the immediate area, include fishing, hiking, picnicking, camping, biking, and viewing scenery. The reservoir and surrounding landscape are characterized by rocky outcrops, and the area vegetation includes large stands of mixed conifer forest, interspersed with open, upland meadows and montane wetland areas. In addition to the expanse of water provided by the reservoir, many smaller bodies of water are in the area such as wetlands, creeks, ponds, and lakes, including Summit Lake, Dinosaur Lake, and Long Lake.

A small Forest Service campground, Granite Campground, is located on the perimeter of the reservoir, and is a non-fee, walk-in campground with four campsites. Generally, use of this campground is limited to day use, although some overnight camping occurs. The existing facilities consist of several fire pits, a few tables, and a vault toilet that presently is not operational. A small boat ramp and parking lot are also present. Only non-motorized boats are allowed on the reservoir. Granite Campground experiences approximately 1,000 recreation visitor days per year.

SCOPING ISSUES

Public and interagency scoping for issues were accomplished early in the analysis process through public meetings, scoping documents, interagency meetings, and internal Forest Service Interdisciplinary Team (ID Team) meetings. Other issues that emerged during the analysis process were also considered in formulating the scope of work and the alternatives. The issues that were considered to be significant and are addressed in detail include:

- Dam Safety/Flood Hazard
- Water Storage Needs
- Hydrology/Fisheries
- Socioeconomics
- Wetlands

Other issues that were not considered as "significant", but were identified as providing important information to the analysis are:

- Vegetation
- Wildlife
- Water Rights
- Water Quality
- Recreation
- Transportation
- Visual Resources
- Cultural Resources

ALTERNATIVES

At the beginning of this analysis, a number of alternatives were formulated as a result of public input on issues identified and developed during scoping, and by specialist recommendations. As the analysis developed, many of the alternatives originally considered for detailed study were eliminated by the Forest Service, based on technical, environmental, economic, legal, and/or regulatory factors. Alternatives considered, but eliminated from detailed study, include the following:

- Larger Fish Creek Reservoir Expansion
- Fish Creek Reservoir Deepening
- Long Lake Reservoir Expansion
- Wren Reservoir Construction
- Nash Reservoir Construction
- Stagecoach Reservoir Expansion
- Lake Catamount Expansion
- Other Basin Reservoir Alternatives

The rationale for elimination of each of the above alternatives is discussed in detail in Section 2.2.

Alternatives to a Proposed Action must also include "...reasonable alternatives not within the jurisdiction of the lead agency (40 CFR 1502.14(c)." In meeting this intent, there are two separate sets of alternatives analyzed. They are:

- Alternatives from which the Forest Service has the authority to select; and
- Alternatives that are not within the jurisdiction of the Forest Service but are available to the City and Mt. Werner to implement.

The Forest Supervisor's decision on this analysis falls under the alternatives available to the Forest Service. These alternatives include:

- Alternative A - No Action
- Alternative B - Fish Creek Reservoir Expansion (Proposed Action)
- Alternative C - Smaller Reservoir Expansion

Several options, which could be applied to the action alternatives (Alternatives B and C), are also presented. These options include:

- Power Supply Options
- Campground Relocation Site Options
- Service Road Options
- Borrow Area Options

Three water supply alternatives are not within the jurisdiction of Forest Service. These alternatives, however, are available to the City and Mt. Werner and include:

- Water Conservation
- Infiltration Gallery Expansion
- Combination Alternative (Water Conservation, Infiltration Gallery Expansion, Fish Creek Reservoir Modernization)

A description of the alternatives available to both the Forest Service and the City and Mt. Werner is presented below.

ALTERNATIVE A - NO ACTION

The National Environmental Policy Act (NEPA) requires that a No Action Alternative be considered in all environmental documents. This alternative serves as the baseline for estimating the impacts of the other alternatives presented in the EIS. For the purposes of this analysis, the No Action Alternative describes the current condition of the reservoir. Under this alternative, a new Special Use Permit would not be granted by the Forest Service to expand the existing Fish Creek Reservoir and the City would continue to operate the reservoir under its existing Special Use Permit.

Environmental Consequences of Alternative A

Environmental consequences include all physical, social, economic, cultural, recreational, and visual impacts associated with the implementation of an alternative. Assuming that the No Action alternative describes the current condition of the reservoir, and that no corrective action has yet been taken by the Forest Service under the terms of the existing permit and/or operating plan, the environmental consequences associated with the implementation of the No-Action Alternative include the following:

- No impact to wetlands
- Continued erosion of Puppy Dog Lake drainage
- No additional water supply or storage capacity; Mt. Werner would have to develop and/or utilize alternative water supplies to meet immediate and long-term water demands; the City would also have to investigate alternative supply sources to meet projected long-term water demands
- No power supply source to the site
- No remote operational control of the raw water system; the reservoir would continue to be operated manually, on-site
- No early warning system to alert City and residents of dam safety conditions
- No in-stream flow augmentation and control; lower reaches of Fish Creek would continue to be reduced to periodic low-flow or no-flow conditions
- No long-term fisheries pool for maintenance of fisheries, recreational activities, and scenic beauty
- Potential impact on socioeconomic climate if lack of water restricts growth
- Continued use of existing service roads
- Continued use of existing campground facilities
- No debt incurred by City or Mt. Werner
- Expenditures to date of approximately one million dollars (for analysis and design of the Proposed Action) would be lost

A further examination of impacts is presented in Section 2.5, Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

The Forest Service could modify the existing Fish Creek Reservoir permit and/or operating plan to address the environmental consequences of the No Action Alternative. Potential mitigation under the No Action Alternative could include:

- Enlargement of outlet pipe in main dam to help reduce flows through Puppy Dog Lake channel
- Erosion protection in the Puppy Dog Lake drainage
- Repair of channel degradation below Puppy Dog Lake
- Upgrade of service roads
- Recommendation for design and implementation of early warning and remote operational control systems

At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event, however, that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further addressed by the Forest Service under the existing permit.

ALTERNATIVE B - FISH CREEK RESERVOIR EXPANSION (Proposed Action)

Under Alternative B, the Proposed Action, the Forest Service would issue a new Special Use Permit to the City to enlarge, use, operate and maintain Fish Creek Reservoir. The proposal includes raising the height of the existing main dam by 20 feet, reconstructing and raising the saddle dam, and creating a new spillway channel. The expansion would allow for an additional 2,280 AF of water storage, from 1,842 AF to approximately 4,122 AF. Fifty acres of shoreline would be inundated, changing the present size of the reservoir from 90 acres to 140 acres. An early warning system would be installed in both the main and saddle dams. An electric underground powerline would be installed to provide power to the early warning and remote off-site operational control system. Funding for this proposal would be provided by both the City and Mt. Werner, with the City financing 25 percent and Mt. Werner financing 75 percent of the cost. City Council has passed a resolution approving the participation of the City in the financing of this proposal, providing that the Proposed Action is approved and all necessary permits are granted (see Appendix I, *City Council Resolution/Reservoir Financial Plan*). The estimated cost of the Proposed Action is $6,000,000 which equates to a unit cost (cost per AF of water) of approximately $2,600/AF.

Environmental Consequences of Alternative B

The environmental consequences associated with the implementation of Alternative B include the following:

- Loss of approximately 15 acres of wetlands.
- Disturbance and loss of upland meadows, mixed conifer forests, and previously undisturbed areas.
- Increased capability to detect and remediate problems with the dams due to the installation of an early warning monitoring system.

- Remote operation of reservoir outlet structure to respond to any detection of imminent dam failure and provide year-around operation capability.
- Correction of erosion problems currently associated with Puppy Dog Lake drainage.
- Ability to store additional water and meet long-term future water demands for the City and Mt. Werner.
- Augmentation of in-stream flows below the intake to the water filtration plant; Fish Creek would remain a live, year-round stream to the confluence with the Yampa River.
- Increase in high mountain lake aquatic habitat and reduction of stream habitat for fish at the reservoir site.
- Maintenance of a 1,030 AF fisheries pool in the reservoir.
- Minor depletion of water for downstream endangered fish species habitat.
- Relocation and upgrading of Granite Campground with improved accessibility for the physically disabled.
- Upgrading of service roads.
- Temporary impacts to road conditions and transportation safety along Buffalo Pass Road and site access roads during construction.
- Temporary displacement of Fish Creek Reservoir visitors and other recreationists in the area during construction; Granite Campground would be unavailable until relocated and rebuilt.
- Temporary impacts to fishery during construction; reservoir would be drained and no fishery would be sustained during the proposed two-year construction period.
- Debt obligation for the City and Mt. Werner for the $6,000,000 expansion; cost would be shared between the City (25%) and Mt. Werner (75%).

A further examination of impacts is presented in Section 2.5, Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

ALTERNATIVE C - SMALLER RESERVOIR EXPANSION

Under Alternative C, the Forest Service would issue a new Special Use Permit to the City to enlarge, use, maintain and operate the Fish Creek Reservoir. The expansion would provide for an additional 908 AF of water storage capacity. The size of the reservoir would be increased to 112 surface acres, a change of about 22 acres from its present size. The main dam would be raised eight (8) feet and the saddle dam would be raised 10 feet. A spillway channel would be constructed, adjacent to the saddle dam. An early warning and remote operational control system would be installed. The City and Mt. Werner would share in the financing of this smaller reservoir expansion.

The estimated cost of Alternative C is $4,200,000 which equates to a unit cost (cost per AF of water) of approximately $4,600/AF.

Environmental Consequences of Alternative C

The environmental consequences of Alternative C are the same as Alternative B with the following exceptions:

- 8.80 acres of wetlands would be impacted
- Mt. Werner and the City would have to develop additional water supplies to meet projected long-term water demands
- The additional water supply would not be of the same water quality as the water from Fish Creek
- The total financial obligations for reservoir expansion ($4,200,000) would be less than under Alternative B
- The cost of construction per AF of water would be $4,600
- Potential impacts to the socioeconomic climate of the community could result if the lack of water resources restricts growth
- A long-term fisheries pool may not be possible
- Future in-stream flow augmentation may be reduced, or not possible, during certain times of the year

A further examination of impacts is presented in Section 2.5 Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

The following three alternatives are available to the City and Mt. Werner. They are not available to the Forest Service because the Forest Service does not have the authority to require conservation or expansion of the infiltration galleries. However, as previously explained, under the National Environmental Policy Act, agencies must include:

> *"...reasonable alternatives not within the jurisdiction of the lead agency (40 CFR 1502.14(c)."*

If the Forest Service selects the No Action Alternative, the City and Mt Werner would have to evaluate other water supply alternatives including conservation, expansion of the infiltration galleries, or a combination of these alternatives. Additionally, some modifications to the reservoir could be required of the City by the Forest Service under the existing Special Use Permit to address public safety and environmental concerns. Water Conservation and Infiltration Gallery Expansion were discussed in the Draft EIS. The Combination Alternative (which includes water conservation, infiltration gallery expansion, and Fish Creek Reservoir modernization) has been developed to address the comments of the Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (COE), and the U.S. Fish & Wildlife Service (USFWS), on the Draft EIS. This

Combination Alternative is being added to the Final EIS, but does not display any impacts that are outside the range of the alternative impacts already disclosed.

WATER CONSERVATION ALTERNATIVE

Water conservation activities are designed to reduce the demand for water, improve efficiency in water use, and reduce the losses and waste of water. The Water Conservation Alternative has been developed under the assumption that the Forest Service would select the No Action Alternative and therefore, the City and Mt. Werner would need to evaluate alternative ways to supply and conserve water. Both the City and Mt. Werner have indicated that even if the Proposed Action is selected, they would continue to implement conservation measures. Conservation measures presently include:

- Metering and billing for actual water used
- Replacement schedule for pipes to control loss in the system
- Voluntary lawn water restrictions between 10:00 A.M. and 5:00 P.M.
- Replacing treated water use with raw water use, when possible
- Required pressure reduction valves
- Study of xeriscape benefits and utilization of xeriscape, where appropriate
- Study of plumbing retrofit in tourist-oriented lodging complexes
- New construction ordinances requiring water efficient plumbing fixtures

It is important to note that the ultimate results of implementing a formal water conservation program would rely on many site-specific factors and would depend largely on the cooperation of the community. It would take several years before the effects of conservation are realized and facility expansion could still be required, although a savings of 10-20% attributable to conservation efforts is estimated.

Environmental Consequences of Water Conservation

Under the conservation alternative, water demands could be reduced by approximately 10 to 20 percent. This represents a water savings of approximately 260 to 520 AF/year today; 500 to 1,000 AF/year in the year 2013; and 930 to 1,860 in the year 2033. The short-term consequences of this reduction in water demand include increased streamflows and increased water levels in the reservoir. In the long-term, however, the consequences would be the same as those described under the No Action Alternative.

Cumulative impacts associated with the reduction in water demand would include the cost savings associated with the decrease in water and wastewater treatment volumes. Water and wastewater treatment operation and maintenance costs would be reduced and costly treatment plant expansions could be avoided. Additionally, infrastructure capital and operation costs associated with the distribution of water and collection of wastewater could be reduced.

With a metered billing rate, however, conservation could also result in decreased water and wastewater utility revenues. Furthermore, it could take several years before the effects of conservation are realized and facility expansion could still be required.

Additionally, the utilization of water conservation techniques, such as xeriscaping, could alter the visual nature of the landscape to a more native appearing landscape.

INFILTRATION GALLERY EXPANSION ALTERNATIVE

Another alternative available to the City and Mt. Werner is the Infiltration Gallery Expansion. The City and Mt. Werner have both constructed infiltration galleries (also known as well fields) to augment the water supplied from the Fish Creek basin. The main purpose of the infiltration galleries is to provide a point of redundancy to the primary Fish Creek water supply. The galleries are also utilized as a supplemental supply during peak water demands.

There have been water quality concerns associated with the use of the infiltration galleries. The alluvial groundwater of the Yampa River Basin has a high mineral content and is higher in alkalinity, hardness, and dissolved solids than the Fish Creek source. Additionally, the alluvial groundwater has relatively high concentrations of iron and manganese and has exceeded secondary drinking water standards. While iron and manganese are not suspected to cause any health problems, they are known to create aesthetic impacts such as objectionable taste and odor; staining of fixtures; and pool discoloration.

Under the Infiltration Gallery Expansion Alternative, the City and Mt. Werner would expand the galleries and pump water from this system into the service area. A second water filtration plant (in addition to the existing Fish Creek Filtration Plant) would be constructed at the infiltration gallery site and the City and Mt. Werner would have to operate two separately located facilities.

Environmental Consequences of the Infiltration Gallery Expansion

Environmental consequences associated with the expansion of the infiltration galleries include the following:

- Inferior water quality provided to a portion of the community
- Loss of a redundant (back-up) water source
- Impact to approximately 3 acres of wetlands
- Impact to high value riparian area and disturbance to heron rookery in the Yampa Valley
- A long-term fisheries pool at the existing reservoir may not be possible
- Long-term in-stream flow augmentation in lower Fish Creek may not be possible
- The need to construct, operate, and maintain a second water filtration plant
- The need to construct, operate and maintain additional water distribution facilities
- Greater operation and maintenance (O&M) costs (resulting in higher water rates) associated with additional treatment and pumping
- Higher power requirements for pumping (resulting in increased utilization of non-renewable energy resources and increased air pollution)
- Modernization and upgrade of the Fish Creek Reservoir would not occur

COMBINATION ALTERNATIVE

Under a Forest Service No Action decision, the City and Mt. Werner would be required to develop alternative water supply sources to meet Mt. Werner's immediate needs and the City's long-term needs. The following Combination Alternative has been developed by the City and Mt. Werner, at the request of the EPA, COE, and USFWS. This alternative consists of the following three major components:

- Water Conservation
- Infiltration Gallery Expansion
- Fish Creek Reservoir Modernization

The water conservation and infiltration gallery expansion components of this alternative have been discussed. A number of improvements at the existing reservoir would also be implemented under this alternative. No additional water storage capacity, however, would be created. Reservoir modernization improvements include:

- Addition of a larger outlet structure
- Repair of the erosional damage in the Puppy Dog Lake channel
- Installation of an underground electric power supply
- Installation of a remote operational control and early warning system
- Repair and upgrade of existing roads
- Visual mitigation at the site (including revegetation and maintenance shed repair)

Environmental Consequences of Combination Alternative

Environmental consequences of the Combination Alternative include:

- Inferior water quality provided to a portion of the community
- Loss of a redundant (back-up) water source
- Impact to approximately 3 acres of wetlands due to construction of infiltration galleries
- Impact to high value riparian area and disturbance to heron rookery in the Yampa Valley
- A long-term fisheries pool at the existing reservoir may not be possible
- Long-term in-stream flow augmentation in lower Fish Creek may not be possible
- The need to construct, operate, and maintain a second water filtration plant
- The need to construct, operate, and maintain additional water distribution facilities

- Greater O&M costs (resulting in higher water rates) associated with additional treatment and pumping

- Higher power requirements for pumping (resulting in increased utilization of non-renewable energy resources and increased air pollution)

MITIGATION DEFINED UNDER THE PROPOSED ACTION

The impact analysis indicates that without mitigation, environmental consequences from permitting the expansion of the reservoir would result in a number of negative impacts, including: 15.09 acres of wetlands would be impacted; Granite Campground, parking area, and a portion of a service road would be inundated; the City and Mt. Werner would incur debt; recreation activities would be disrupted for a period of two years during construction; roads providing access to the area would be affected from impacts of heavy construction machinery; fish would be lost; and water supply would be affected during construction.

Through the use of mitigation measures, all negative impacts could be eliminated or reduced to acceptable levels. Mitigation specific to the Proposed Action includes, but is not limited to:

Wetlands - The U.S. Army Corps of Engineers (COE) requires a 404 permit for the dredge and fill activities associated with the Proposed Action. Existing wetlands would be lost through implementation of the Proposed Action and replaced through mitigation. A wetlands mitigation plan has been developed and submitted to the COE. Additionally, off-site mitigation is presently being discussed and a mix of on-site and off-site wetlands mitigation is being considered. Off-site mitigation is being proposed on an area of land along the Yampa River that is owned by the City. A replacement ratio of 1.5 acres for every 1.0 acre of wetlands lost is being suggested. The immediate short-term goal for mitigation would be to artificially construct wetlands of similar size and configuration to those that would be directly or indirectly impacted under the Proposed Action. The long-term goal would be to ensure that the artificially constructed wetlands provide equivalent functions and values as those impacted.

Puppy Dog Lake Drainage - The Forest Service has identified a need for change in the current operation of the reservoir system to control the erosion and channel degradation taking place in the Puppy Dog Lake drainage. The proposed expansion would increase the water storage capacity available to contain spring runoff flows, increase the outlet capacity of the main dam into the Middle Fork of Fish Creek, and allow for remote operation of the outlet structure. These design features would allow operation of the reservoir to be altered such that a greater portion of spring runoff flows could be stored, and/or released through the main outlet structure, in order to reduce flow volumes released through the spillway. Restoration of degraded areas would occur both naturally and through manual restoration efforts. Monitoring of channel flows would occur.

Water Depletion - Depletion of water from the reservoir and stream system would be mitigated in the form of a payment by the applicants to the U.S. Fish and Wildlife Service, per their depletion formula (See Appendix J, *Biological Assessment*).

Water Rights - Under the Proposed Action, 200 AF of storage capacity would be released to augment in-stream flows in Fish Creek below the intake to the water filtration plant. A stipulation has been reached between the City and the Colorado Water Conservation Board (CWCB) to meet this CWCB junior in-stream flow right.

Construction-Related Activities - Under the Proposed Action, all plans concerning the construction of new facilities at Fish Creek Reservoir would be approved by the Forest Service, prior to implementation. Construction plans would include detailed site-specific planning documents addressing transportation, water quality monitoring, on-site worker facilities, schedules, safety, explosive use, timing of activities, monitoring by proponents, and best management practices. A road maintenance agreement has been reached between the City, Mt. Werner, and Routt County that addresses County road impacts resulting from construction activities.

Recreation - Temporary interruption of recreational activities would occur under the Proposed Action. Recreationists would be dispersed and directed to other camping and fishing facilities in the area. Informational signs and media notification would be implemented. A reservoir draw down schedule has been developed by the applicants to address recreation and visual concerns.

Fisheries - Fishing opportunities would not exist during construction under the Proposed Action. The reservoir would be restocked after completion of construction activities. A regular stocking schedule would be negotiated between the City and the Colorado Division of Wildlife. A 1,030 AF fisheries pool would be established.

Visual Resources - Design criteria would incorporate Forest Service visual quality objectives to maintain the integrity of the aesthetic environment and minimize the impacts to visual resources.

Campground Restoration and Relocation: Loss of the existing Granite Campground under the Proposed Action would be mitigated by reconstruction and relocation of the campground. A new campground would be constructed and include universal design, as required under the Americans With Disabilities Act (ADA). The timing of the construction of the proposed new campground would coincide with construction activities of the reservoir. The campground would be fully operational at the completion of the reservoir enlargement. Construction plans would be approved by the Forest Service prior to commencement of construction. The Forest Service and the project Applicant would inspect construction activities.

Service Roads: The service roads to the dams are presently deteriorating and a portion of the service road to the main dam would be inundated. The roads would be upgraded to present Forest Service standards, including proper drainage and maintenance. That portion of the road to be inundated would be relocated, minimizing visual and wetlands impacts.

Monitoring: The City and Mt. Werner have agreed to contribute $10,000 to the Forest Service to help fund a Forest Service project coordinator to monitor the construction activities associated with expansion of the reservoir. The City would also designate a project coordinator during construction.

Implementation: Under the Proposed Action, implementation would take place during two summer construction seasons.

Debt: Debt obligation for the City and Mt. Werner for the $6,000,000 expansion would be shared between the City (25%) and Mt. Werner (75%).

The aforementioned mitigation and the costs associated with the mitigation would be the responsibility of the City and Mt. Werner. Their Mitigation Plan has been included as Appendix K, Project Mitigation.

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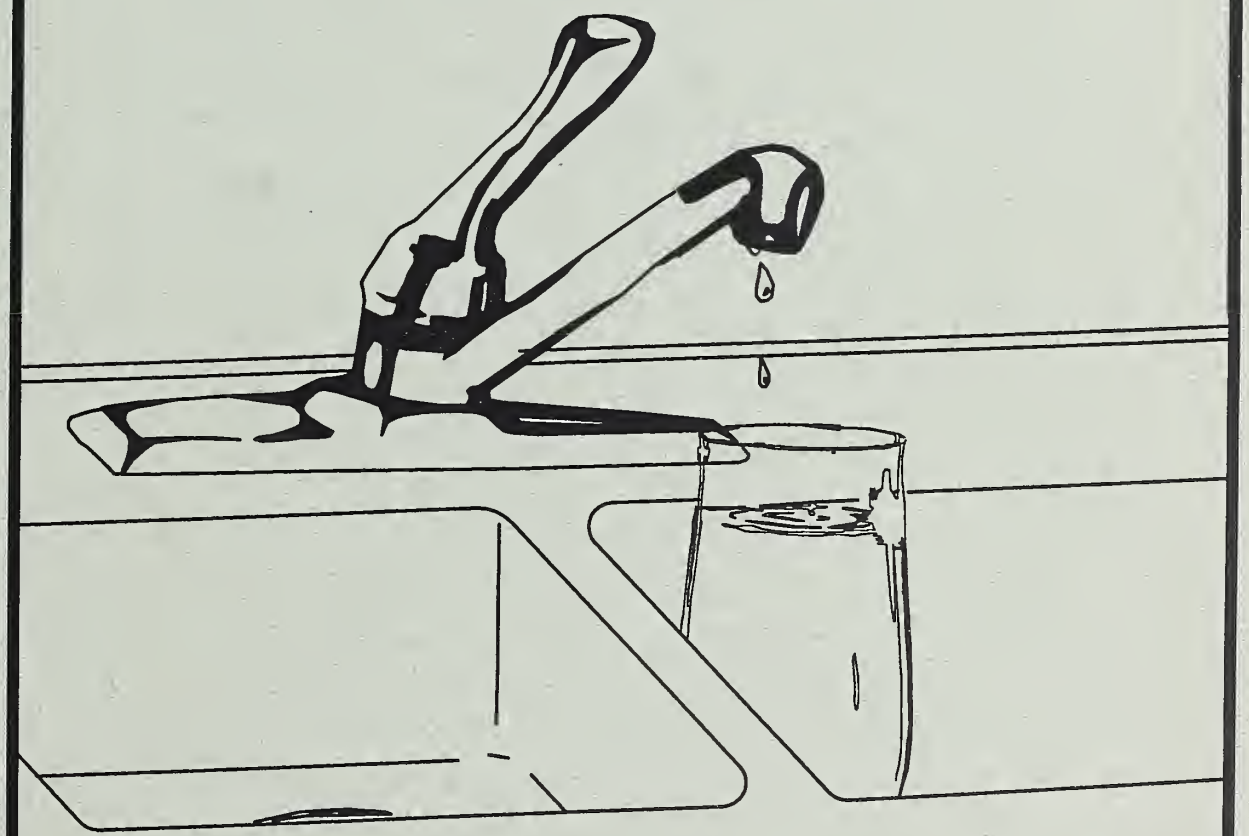
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CHAPTER 1

PURPOSE OF & NEED FOR ACTION



CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

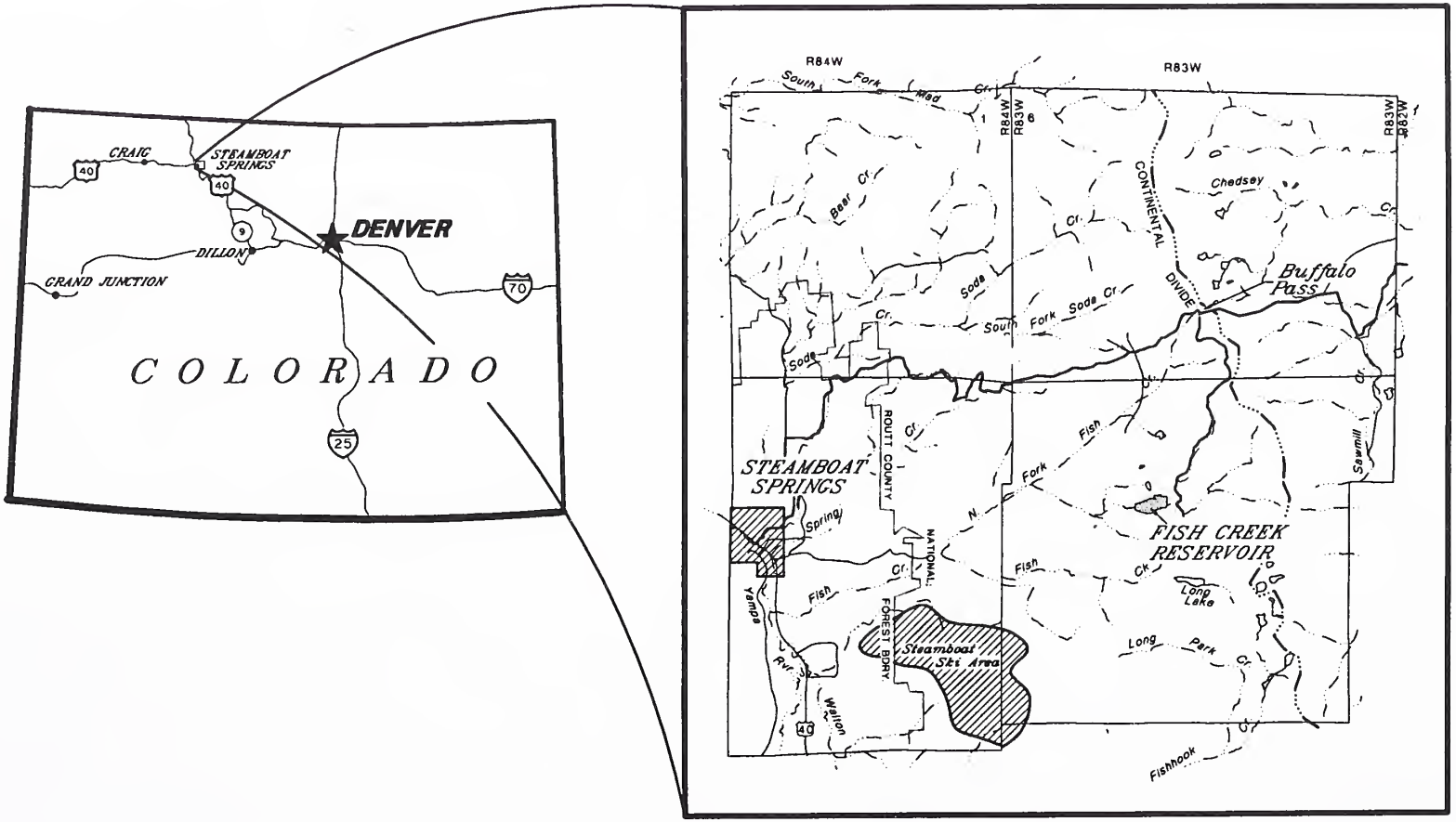
In February 1992, representatives of the City of Steamboat Springs (City) and Mt. Werner Water and Sanitation District (Mt. Werner) met with the U.S. Forest Service (Forest Service) to discuss the potential expansion and modernization of the Fish Creek Reservoir. Mt. Werner, having no water storage capacity, is seeking to enlarge the reservoir in partnership with the City to create water storage capacity to meet Mt. Werner's immediate water storage needs. The City would also benefit by having an upgraded facility and more water storage capacity to meet its long-term water demands. Both the City and Mt. Werner provide water service to residents of the City of Steamboat Springs. The Forest Service, recognizing the City as the existing Special Use Permittee for the reservoir, encouraged the two water providers to submit a joint application for the expansion proposal, wherein the City would be the main applicant. This would avoid the possibility of the Forest Service having to administer two separate permits on the same reservoir. Consequently, the City, in partnership with Mt. Werner, submitted a Special Use Application to the Hahns Peak District of the Routt National Forest, Steamboat Springs, Colorado. The City and Mt. Werner are referred to collectively hereafter as the "Applicant".

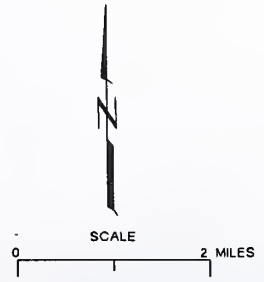
The City and Mt. Werner are proposing to enlarge the Fish Creek Reservoir by raising the height of the existing main dam 20 feet, reconstructing and raising the saddle dam, and creating a new spillway channel. The proposal provides for an increase in storage capacity of 2,280 acre-feet (AF), from 1,842 to 4,122 AF. Fifty acres of shoreline would be inundated, changing the present size of the reservoir from 90 acres to 140 ares. Also included in the expansion proposal is the installation of an early warning monitoring system, and the development of a remote, off-site management system for the operation of the reservoir. An electrical underground powerline, stemming from an existing powerline on Buffalo Pass, is being proposed to provide power for the remote operation of the dam and the early warning monitoring system. The construction activities associated with the proposal would take two summer construction seasons to complete.

Fish Creek Reservoir is located on the Routt National Forest, four miles south of Buffalo Pass, in Routt County, Colorado, as shown in Figure 1-1, General Location. The management prescription for the area surrounding the reservoir, as identified in the Routt National Forest Land and Resource Management Plan, 1983 (Forest Plan), is 10E, which provides for management of municipal and supply watersheds. A general description and goals of the 10E management prescription are as follows:

> *"Management emphasis is to protect or improve the quality and quantity of municipal water supplies. Management practices may vary from use restrictions to water resource improvement practices, with the primary object of meeting water quality standards established from the individual watershed. A secondary objective is to manage the watershed to improve the yield and timing of water flows, consistent with water quality requirements" (USDA Forest Service, 1983).*

The management prescriptions for Fish Creek Reservoir and the surrounding area are shown in Figure 1-2, Management Prescriptions.



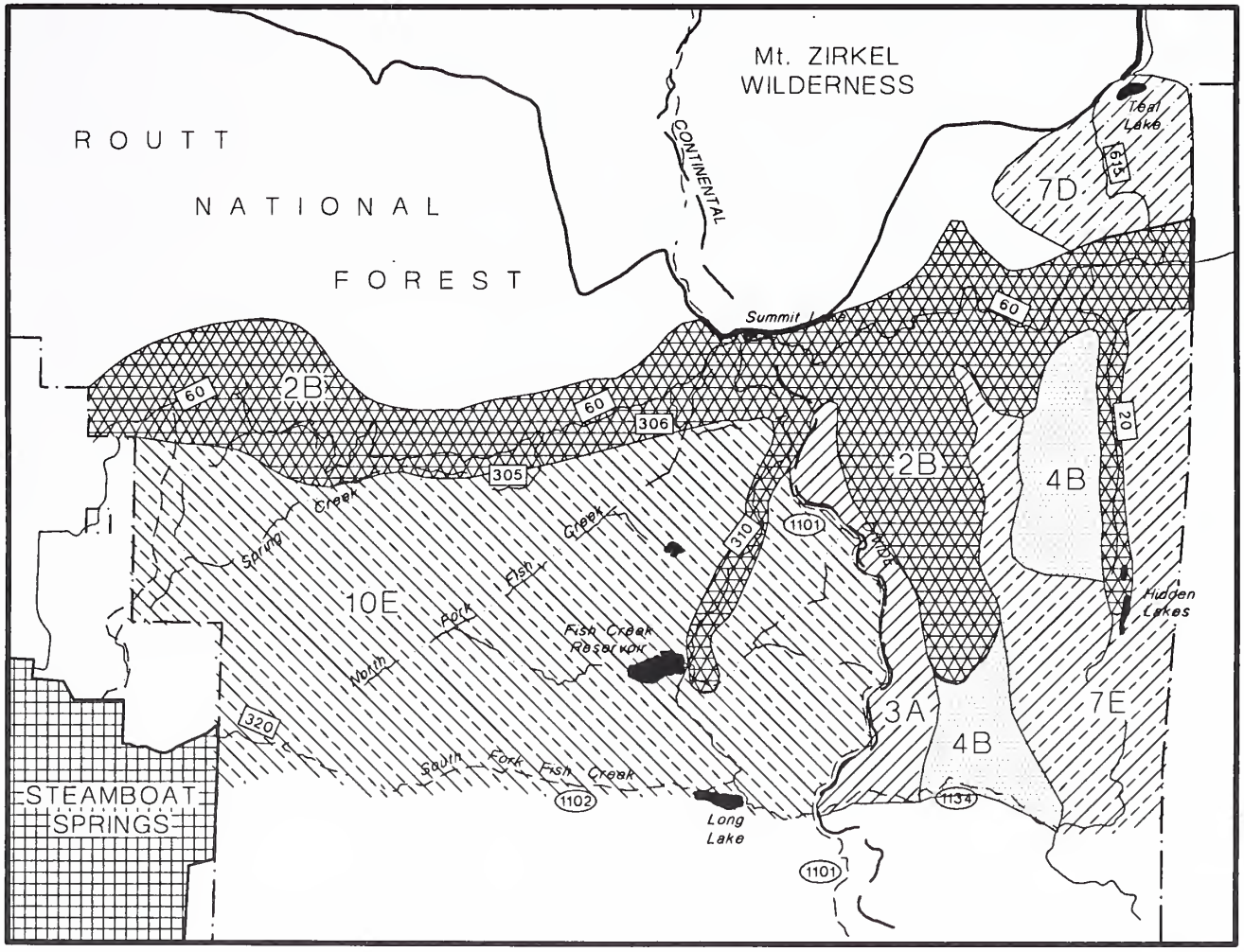


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FIGURE 1-1

FISH CREEK EIS

GENERAL LOCATION



LEGEND

- ROUTT NATIONAL FOREST BOUNDARY
- (1101) FOREST DEVELOPMENT TRAIL
- [305] FOREST DEVELOPMENT ROAD

MANAGEMENT PRESCRIPTION

- 10E - MUNICIPAL WATERSHEDS
- 2B - RURAL/ROADED NATURAL RECREATION
- 3A - SEMI-PRIMITIVE NONMOTERIZED RECREATION
- 4B - WILDLIFE-FAVOR INDICATOR SPECIES
- 7D - WOODFIBER PRODUCTION - ROUNDWOOD HARVEST
- 7E - WOODFIBER PRODUCTION - SAWTIMBER, SHELTERWOOD, SPRUCE & FIR, CLEARCUT LODGEPOLE

SOURCE: USDA - FOREST SERVICE-ROUTT NATIONAL FOREST.

N

SCALE
0 5,000 10,000'

Project No.:	Design By:	Scale:
828-1500	L. LABOVITCH	SEE SCALE BAR
File:	Drawn By:	Date:
FC1PRE.DWG	T. CLARK	January, 1993

FIGURE 1-2

FISH CREEK RESERVOIR EIS

MANAGEMENT PRESCRIPTIONS

1.2 PURPOSE OF AND NEED FOR PROPOSED ACTION

The purpose of and need for the proposed action, as described below, is consistent with the Forest Plan.

1.2.1 Purpose of Proposed Action

The purpose of the Proposed Action is to provide a high quality, cost effective, and reliable water supply to meet the immediate water storage needs of Mt. Werner and to meet the long-term municipal water demands of residents of both the City and Mt. Werner water service areas.

1.2.2 Need For Proposed Action

The City and Mt. Werner are two separate water providers. The City relies upon Fish Creek streamflow and water stored in Fish Creek Reservoir as its primary municipal water source. Mt. Werner has no storage capacity and relies primarily on Fish Creek flow to meet its service area water demands. Mt. Werner presently borrows storage water from the Fish Creek Reservoir to meet its service area demands, because water demands exceed Mt. Werner's direct flow water rights in Fish Creek. The City presently has sufficient water storage capacity for its service area water demands, but additional storage is needed to meet long-term water needs.

In 1981, the City began planning for its long-term water needs. These planning efforts identified the need for 2,000 AF of additional reservoir storage capacity and recommended the Fish Creek Reservoir expansion as the most cost-effective way of achieving this goal. Also recommended was construction of a 5.0 million gallon per day (MGD) water filtration plant on Fish Creek. Additionally, the development of an infiltration gallery along the Yampa River was identified in the City's plan as a means of providing peaking capacity and a point of redundancy to the water system. The infiltration gallery could deliver treated water into the distribution system in the event of failure in the Fish Creek supply and/or filtration system. Of these three recommendations, the planning efforts identified the filtration plant as the most urgently needed, followed by the development of the infiltration galleries, and finally, the Fish Creek Reservoir enlargement.

In 1980, the City applied for, and received, a conditional water right decree for 2,000 AF of water storage in the Fish Creek Reservoir. In 1985, the City completed a 3.0 MGD enlargement of Mt. Werner's water filtration facility on Fish Creek. In 1989, the City acquired an 80-acre site for the proposed infiltration gallery and in 1991, the City completed work on the gallery. The expansion of the Fish Creek Reservoir is the remaining element of the City's 1981 water planning efforts.

In addition to Mt. Werner's immediate need for water storage, the City and Mt. Werner considered other economic and environmental factors in determining why it would be in the public's best interest to expand the reservoir at this time. These factors include:

- Present day interest rates are extremely favorable and are at a historic low. Taking advantage of these rates would represent a significant savings to the taxpayer.

- Both the City and Mt. Werner are in a position to financially and technically undertake the six million dollar proposed expansion at this time. The Steamboat Springs City Council passed a resolution approving a financial arrangement for the expansion of the reservoir if the Forest Service selects the Proposed Action after analysis.

- The Fish Creek Reservoir is an existing facility. No undisturbed site would have to be impacted to increase the municipal water supply.

- Due to the design and operation of the existing reservoir, environmental damage is occurring to the Puppy Dog Lake channel, located below the spillway of the Fish Creek Reservoir. Prior to the construction of the reservoir, most of the spring runoff flow was naturally channelized through the Middle Fork of Fish Creek. Presently, however, high spring runoff flows are released through the spillway to Puppy Dog Lake and its drainage channel. This is occurring because the main dam outlet is not large enough to carry these seasonal flows to the Middle Fork of Fish Creek. Consequently, the increased flow, and subsequent erosional process, has caused the natural Puppy Dog Lake channel to change dramatically. The proposed project would re-establish the natural flow regime and most of the spring runoff flow would be carried through a larger outlet structure in the main dam to the Middle Fork of Fish Creek. Runoff flow through the spillway and the Puppy Dog Lake channel would therefore be minimized, allowing for the rehabilitation of the channel.

- It would be less environmentally damaging to expand the reservoir at this time because the reservoir could be drained during construction without causing a serious water shortage to the residents of Steamboat Springs. An upstream (inside) raise of the dam could be accomplished which would minimize the impacts to the environment. If the reservoir expansion is delayed, future water demands would prevent draining the reservoir during the construction period. Consequently, this delay would result in a downstream (outside) raise of the dam, which would be more costly and cause greater impacts to the area, particularly in terms of wetlands destruction.

1.3 MODERNIZATION OF RESERVOIR

Included in the expansion proposal are several facility modernization elements. Modernization of the existing reservoir would improve the facility from a public safety standpoint and add to the efficiency of the water delivery system. These modernization elements are described below.

1.3.1 Early Warning Alarm System

Fish Creek Reservoir is located in a remote location on the Routt National Forest. Due to the amount of snowfall in the area, access to the reservoir is limited from November through June of each year. The reservoir and dams are usually covered by snow eight months of the year. Because of the remote location of the reservoir and heavy snow coverage, it is impossible to detect seeps or leakage at the dams during most of the year. In addition, the ability to reach the dams, in the event of an indication of dam failure, is severely limited by these factors.

The Fish Creek Reservoir has two earthen dams, the main dam and the saddle dam. Both dams are classified as "Class A - High Hazard", since dam failure could cause extensive downstream property damage, and possibly loss of life. These dams presently do not have an early warning system installed to alert the City or Mt. Werner of potential dam problems. The enlargement proposal includes the installation of an early warning monitoring system that would alert the City to any sudden increase or decrease in the water flow below the dams and/or any change in pressure within the dams. This system would allow the City to investigate, and respond to, any unusual changes

in water pressure (head) and/or flow and continually maintain the integrity of the dams. Additionally, this system would enhance the City's ability to warn residents and implement an emergency evacuation plan in the event of an imminent dam failure.

1.3.2 Remote, Off-Site Operation of Reservoir

The operation and control of water releases from the Fish Creek Reservoir presently occur on-site. Releases from the reservoir are made by manual adjustments to the outlet gate in the spring and fall of each year. Under best conditions, this requires a half day to accomplish. Under adverse conditions, it is not possible at all. Consequently, reservoir releases are generally made in excess of demand. The enlargement proposal provides for the ability to operate releases from a remote, off-site location. Remote operation would allow for the controlled release of water in response to water demands and for the maintenance of in-stream flows. It would also provide for immediate operator attention to any changes in dam characteristics.

1.3.3 Power Source

An underground electric powerline is being proposed as the power source for both the remote, off-site reservoir operation system and early warning monitoring system. This underground powerline would stem from an existing powerline located approximately three miles away from the reservoir on Buffalo Pass.

1.3.4 Redesign of Spillway Channel and Outlet Works

The proposed project includes a new 80-foot wide spillway channel which would be cut into bedrock on the right abutment of the saddle dam. This spillway channel would be designed to help minimize the velocity and amount of water being routed through Puppy Dog Lake and the channel downstream of Puppy Dog Lake. A new high-level outlet works would be constructed on the main dam for normal reservoir operation, and, along with the existing outlet, would provide a means of draining the reservoir during an emergency. The existing outlet pipe would be extended and rehabilitated. The outlet works would be operated to reduce flow into the Puppy Dog Lake drainage during spring runoff.

1.4 OTHER ELEMENTS OF THE PROPOSED ACTION

The proposed action includes several elements that contribute to the overall purpose of and need for the project. These elements could be considered as benefits resulting from the Proposed Action. They include the following:

1.4.1 Maintain In-Stream Flow Rights and Enhance In-Stream Flows

The Colorado Water Conservation Board (CWCB) holds a junior in-stream flow right of 2 cubic feet per second (cfs) on Fish Creek, downstream of the water filtration plant. However, with diversions from the stream to the filtration plant, and to several ditches below the filtration plant, flow in Fish Creek commonly drops below 2 cfs. This occurs primarily in August and September, when stream flow is at a minimum but water demand, both municipal and agricultural, is still high. Although the CWCB rights are junior water rights within the Fish Creek basin, under the Proposed Action CWCB and the City have reached an agreement which ensures that the 2 cfs in-stream flow right would be maintained. The additional storage capacity and the remote operational control provided by the Proposed Action would allow for maintenance of the CWCB in-stream flow right. The

stream below the water filtration plant to the Yampa River would remain a live stream throughout the entire year, and the potential to maintain fisheries in this reach of the stream would be enhanced. Additionally, increased flow to the Yampa River would contribute to downstream fish habitat.

1.4.2 Preserve Recreational Resources and Fisheries

Projected water demands for the City and Mt. Werner indicate that the Fish Creek Reservoir would be virtually drained on an annual basis to meet long-term future water needs (ACZ, 1992b). In order to protect the existing recreational resources and maintain a viable reservoir fishery, a fisheries pool has been recommended to the City by the Forest Service as an element of the project proposal. (A fisheries pool is the volume of water required to allow regular over-wintering of healthy, self-sustaining fish populations). The size of the fisheries pool would be 1,030 AF. The City has agreed to maintain this fisheries pool as part of its Proposed Action and will coordinate with the Colorado Division of Wildlife to develop a stocking schedule. The reservoir would be restocked by the City if any construction activities occur, or if in an emergency drought, the pool is drawn down.

1.4.3 Prevent Continued Environmental Degradation to Puppy Dog Lake Drainage

The Forest Service has identified a need for change in the current operation of the reservoir system to control the significant erosion and channel degradation presently taking place in the Puppy Dog Lake drainage. Puppy Dog Lake is a small lake just below the Fish Creek Reservoir saddle dam and spillway. As the reservoir presently operates, high spring runoff flows are released through the spillway to Puppy Dog Lake and its drainage channel, rather than through the main channel of the Middle Fork of Fish Creek. The drainage area of the Puppy Dog Lake drainage is approximately 16 percent of the drainage area of the Middle Fork of Fish Creek at the main dam. Due to the large flow volumes routed through the Puppy Dog Lake drainage during the spring runoff period, the drainage basin has been significantly altered. Severe erosion of the existing channel has resulted and has caused downstream sedimentation.

The proposed expansion would increase the water storage capacity available to contain spring runoff flows, increase the outlet capacity of the main dam into the Middle Fork of Fish Creek, and allow for remote operation of the outlet structure. These design features would allow operation of the reservoir to be altered such that a greater portion of spring runoff flows could be stored, and/or released through the main outlet structure in order to reduce flow volumes released through the spillway. Restoration of degraded areas would occur both naturally and through mitigation efforts.

1.4.4 Provide Continued High Quality Water Source to Service Areas

The expansion of the Fish Creek Reservoir would ensure that the same high quality water supply presently being used as the primary municipal water supply would continue to be provided to the service area.

1.5 RESPONSIBLE OFFICIAL AND DECISION TO BE MADE

An Environmental Impact Statement (EIS) is a document that discloses the environmental consequences of implementing a proposed action and alternatives to that action. It is not a decision document itself, but rather the analysis upon which the decision can be reached. The decision is documented in a Record of Decision (ROD) and is made by the Routt National Forest Supervisor. The Forest Supervisor may select one of the alternatives analyzed in this EIS in total, or a portion, combination, or modification of the alternatives analyzed. Management constraints and/or

mitigation measures may also be specified. The Forest Supervisor's decision applies only to National Forest lands analyzed in the EIS.

The Forest Supervisor's decision on this analysis falls under the alternatives available to the Forest Service. These alternatives are as follows:

- To deny the permit (Alternative A - No Action)
- To approve the proposal (Alternative B - Fish Creek Reservoir Expansion (Proposed Action))
- To approve the proposal as modified (Alternative C - Smaller Reservoir Expansion)

Because some significant issues raised fall outside of the Forest Service authority or ability to implement, the impacts associated with those issues are nevertheless being disclosed under alternatives available to the City and Mt. Werner, in keeping with the National Environmental Policy Act's (NEPA) disclosure requirement. Additional alternatives available to the Applicant but outside the jurisdiction of the Forest Service include:

- Water Conservation
- Infiltration Gallery Expansion
- Combination Alternative (Water Conservation, Infiltration Gallery Expansion, Fish Creek Reservoir Modernization)

1.6 AGENCY RESPONSIBILITY

Consistent with the stated purpose and need and related requirements for regulatory approvals, this EIS will be used by a number of Federal, State, and local agencies and governmental entities having jurisdictional responsibility for affected lands and resources. Information presented in this EIS will be the basis for evaluation of the project proposal and alternatives with respect to potential project-related environmental impacts, both beneficial and adverse, and for regulatory compliance. Decisions by other jurisdictions to issue or not issue approvals related to this proposal may be aided by the disclosure of impacts found in this document. Other jurisdictions may, however, require additional information relative to their permitting process requirements. The following sections identify those agencies and other government entities having jurisdictional responsibility for review of and/or action on the project proposal.

1.6.1 Federal Government

1.6.1.1 Forest Service

The Forest Service must issue a Special Use Permit prior to any development on National Forest land. Additionally, prior to any construction on National Forest land, construction plans must be submitted to, and approved by, the Forest Service. Operating plans must be submitted to, and approved by the Forest Service, for both construction activities and post-construction system operation. The Special Use Permit becomes operational after all permits and approvals, as required by law, are issued. Although the City already has a Special Use Permit for the present operation

of the reservoir, a new permit would be required if the Special Use Application for the reservoir expansion is approved.

1.6.1.2 United States Army Corps of Engineers (COE)

The U.S. Army Corps of Engineers (COE) is authorized by Section 404 of the *Clean Water Act* to issue permits for the discharge of dredged or fill material into waters of the United States at specified disposal sites. Waters of the United States include all interstate and intrastate waters such as lakes, rivers, streams, sloughs, wetlands, wet meadows, natural ponds, and impoundments. Section 404 prohibits discharge of dredged or fill material into waters of the United States without a valid 404 permit.

Potential impacts to jurisdictional wetlands are reviewed and approved or denied under a site-specific individual permit application. An individual permit will be required for the expansion of Fish Creek Reservoir.

1.6.1.3 Environmental Protection Agency (EPA)

Under NEPA, the Environmental Protection Agency (EPA) is required to review and comment on "major federal actions that have a substantial impact on the human environment." The EPA's responsibility and role is to provide scoping comments, review EIS's, and provide information and appropriate technical assistance during and following the environmental analysis process. Specific environmental legislation, for which the EPA is responsible and that is applicable to the proposal, include the *Clean Water Act* and the *Safe Drinking Water Act.* Some administrative and enforcement responsibilities of these acts have been delegated to the State of Colorado.

1.6.1.4 United States Fish and Wildlife Service (USFWS)

Under the provisions of the *Fish and Wildlife Coordination Act,* the United States Fish and Wildlife Service (USFWS) provides consultation regarding federally permitted projects that affect fish and wildlife resources. Under Section 7 of the *Endangered Species Act,* the USFWS provides consultation on potential impacts to threatened and endangered species and issues a biological opinion. Formal Section 7 consultation was initiated on March 5, 1993 with the USFWS, and a Biological Assessment was submitted. The USFWS's Biological Opinion is included with the ROD.

1.6.2 State Government

1.6.2.1 Colorado Department of Health - Water Quality Control Division (WQCD)

The Water Quality Control Division (WQCD) has authority under CRS 25-8-302 to implement Section 401 of the *Clean Water Act.* The WQCD reviews projects which require federal licenses and permits (such as a COE Section 404 permit), and certifies, conditionally certifies, or denies certification. Certification is given if no significant impairment of a classified use by exceedence of water quality standards can be reasonable assured. The WQCD may specify certain management and certification requirements as detailed in their regulations governing 401 certification.

Additionally, the WQCD requires that permits be obtained for wastewater treatment facility discharges, dewatering, and stormwater runoff.

The WQCD also approves the location, design, and capacity of water and/or wastewater treatment facilities.

1.6.2.2 Colorado Department of Natural Resources (CDNR)

Several divisions within the Colorado Department of Natural Resources (CDNR) have project responsibilities, including:

- Colorado Division of Wildlife (CDOW) - The CDOW is responsible for protection and management of state wildlife and fish resources through participation in NEPA and Section 404 of the Clean Water Act.
- Colorado Geological Survey (CGS) - The CGS is responsible for the identification of geologic hazards and may suggest mitigation measures to reduce potential geologic impacts.
- Colorado Water Conservation Board (CWCB) - The CWCB is responsible for providing floodplain information and analysis of water supply and flood hazard mitigation. The CWCB is also responsible for the maintenance of minimum in-stream flows.
- State Engineer/Colorado Division of Water Resources (CDWR) - The CDWR is responsible for administering water rights. They are also responsible for dam safety and for the review and approval of dam designs.

1.6.2.3 Colorado State Historic Preservation Office (SHPO)

The State Historic Preservation Office (SHPO) reviews and provides guidance to the Forest Service on cultural resource investigations, determinations, and mitigation plans. SHPO must concur with any recommendation of eligibility of a site or structure to the National Register of Historic Places. SHPO also consults with the Advisory Council on Historic Preservation in compliance with the *National Historic Preservation Act* (16 U.S.C. 470F).

1.6.3 Local Government

Routt County reviews NEPA documents for consistency with County planning actions. The County also provides review of transportation concerns, road impacts, infrastructure requirements, and identifies other County planning concerns.

1.7 SCOPING AND PUBLIC INVOLVEMENT

As required by NEPA (CEQ 1501.7), the Forest Service has provided for an early and open process to determine the scope and significance of issues to be analyzed, and to determine what type of environmental analysis should be prepared. Both internal (Forest Service) and external (public) scoping efforts led to the decision to prepare an Environmental Impact Statement to disclose the impacts of the Proposed Action on the physical and human environment.

The Forest Service began public scoping by mailing a scoping document to all boxholders in the City on March 6, 1992. This scoping document identified the project Applicant and provided information to the public relative to the proposal, location, possible issues, and alternatives to be

discussed. A public meeting was held on March 18, 1992 to discuss the proposal, receive comments, and identify public issues. Approximately 30 public comment letters were received during scoping. Newspaper articles have continued to provide information to the public. The Forest Service identified its Interdisciplinary Team (ID Team), comprised of specialists from those resources affected by the issues identified. An ID Team meeting was held on May 29, 1992 to scope for internal issues and additional concerns not identified by the public. Issues were determined to be significant or insignificant, and the scope of the EIS was established. Members of the ID Team are listed in Chapter 5, List of Preparers.

Other scoping efforts included:

- A meeting with an EPA representative and the Forest Service in Steamboat Springs on August 4, 1992 to discuss the project and EPA issues and concerns.

- A meeting with Division of Wildlife (DOW) representatives on August 4, 1992 to discuss fisheries and wildlife issues and any other DOW concerns relative to the proposed project.

- An interagency meeting, hosted by the U.S. Army Corps of Engineers (COE), in Grand Junction, Colorado on September 16, 1992 which included the USFWS, the DOW, and the EPA. The Forest Service presented the project proposal and discussed progress on the EIS. The City also participated at the meeting by providing background technical information to the agencies. During the meeting, the agencies raised issues and provided comments to the Forest Service for consideration in the EIS analysis.

- The Forest Service met with the Routt County Commissioners on October 19, 1992, to discuss the project and the analysis. The Commissioners provided comments and identified County issues for consideration in the EIS.

- A meeting was held in Grand Junction on June 8, 1993 with the Forest Service, Applicant, EPA, USFWS, and COE to discuss agency comments on the Draft EIS.

The Forest Service continued to take public and agency comment following the publication of the Draft EIS. Comment letters and responses are included as Appendix A, Draft EIS Comment Letters and Responses.

1.8 ISSUES AND CONCERNS

As a result of the public and agency scoping efforts and ID Team comments, many issues were identified for analysis in the EIS. As required by NEPA, the significance of the issues was then determined. "Significant" issues require in-depth analysis and "insignificant" issues require reasonable justification for not analyzing in detail. To determine the significance of each issue, the ID Team referred to NEPA's definition of "significantly" (40 CFR 1508.27). This definition states that the issue must be considered for context and intensity. The significance of an action varies with the severity of the impacts associated with the proposed action (whether they be beneficial or adverse), and with the setting of the proposed action. *"This means that the significance of an action must be analyzed in several contexts such as the society as a whole (human, national), the affected region, the affected interests, and the locality".*

The ID Team decisions regarding the significance of issues were recorded and are displayed in the ID Team Meeting Minutes presented in Appendix B. NEPA requires agencies to revise determinations if *"substantial changes are made later in the proposed action, or if significant new circumstances or information arise which bear on the proposal or its impacts"* (40 CFR 1501.7).

Following is a synopsis of the issues, concerns, and questions identified by the public and members of the Forest Service ID Team.

1.8.1 Significant Issues

1.8.1.1 Dam Safety/Flood Hazard

A number of comments were received during the scoping process pertaining to dam safety and flood hazard. The primary issues and concerns associated with dam safety and flood hazard include the following:

- **Impacts of a dam failure and a potential flood to the City of Steamboat Springs and residents, workers, and visitors downstream of the dam.** Several individuals expressed concern over the issue of a potential dam failure. Under this issue, the potential for, and consequences of a dam failure, are analyzed in the EIS for the existing structure and all dam alternatives. Engineering studies and flood models for the reservoir are reviewed. The potential for ground shaking and ground rupture is determined based on public information available on faulting and seismic conditions. The City's *Emergency Response Plan* is reviewed.

- **Impacts of an early warning system.** The proposed early warning system is evaluated in the EIS and the potential impacts of the system are discussed.

Dam safety and flood hazard issues and concerns are addressed in Sections 3.2 and 4.2 of this document.

1.8.1.2 Water Storage Needs

Several questions and concerns have been raised by the public regarding the need for an expansion of Fish Creek Reservoir. The primary issues and concerns expressed about the water storage requirements for the project include the following:

- **The timing and size of the proposed reservoir expansion.** Several members of the community expressed concern over the timing and the size of the proposed project. Water usage patterns for the City and Mt. Werner are reviewed to determine whether the need exists for additional water storage. The timing of the proposed expansion is also evaluated. Storage volume requirements are determined for the City, Mt. Werner, and the two water districts combined.

- **Location and distribution of water need.** A concern of the community is the location and distribution of the water need. This EIS analysis assesses water storage requirements for the City, Mt. Werner, and the two water districts combined. It further analyzes whether additional water is necessary for future growth within the existing water service area or whether it is required for an expanded water service area. Water requirements associated with tourism are factored into the analysis.

- **Potential impacts of water conservation programs on the need for additional water storage.** The need for a more comprehensive water conservation program for the community was expressed by several individuals. To evaluate conservation strategies and potential water savings, water conservation methods are reviewed in this EIS document, and the results of a survey of other tourist communities in the southwest are presented. The potential impacts of water conservation on water demand and water storage requirements are assessed. The impacts of conservation are disclosed, although the Forest Supervisor does not have the authority to select conservation as an alternative available to the Forest Service.

- **Potential impacts of consolidation of water districts on the need for additional water storage.** Several community members questioned whether consolidation of the City and Mt. Werner water districts would impact the potential need for expansion of the Fish Creek Reservoir. The impacts of a consolidated district are disclosed, although the Forest Supervisor does not have the authority to select consolidation as an alternative available to the Forest Service.

Water storage requirements are discussed in Section 3.3.7 and 4.3 of this document. Conservation is evaluated in Sections 2.7, 3.3.9, and Appendix C.

1.8.1.3 Hydrology/Fisheries

Many questions and concerns raised by the public during the scoping process pertained to the maintenance of in-stream flows in Fish Creek and the subsequent impacts to fisheries. The primary issues and concerns expressed about fisheries include the following:

- **Potential impacts of changes in channel flow regimes on present fisheries.** While several individuals expressed the need for fish habitat improvement through maintenance of in-stream flows, others felt that flow modifications were unnecessary. The flow regime within Fish Creek is reviewed in the EIS and the impacts of water system operations are assessed. The potential impacts of in-stream flow maintenance to fisheries are discussed.

- **Loss of fisheries during construction activities.** The impacts related to the loss of fisheries during construction activities are addressed in this EIS document; restocking of Fish Creek Reservoir is discussed.

Fisheries are discussed in Section 3.8, Section 4.8 and Appendix J of this document. A discussion of hydrology is presented in Section 3.3.2 and Section 4.3.

1.8.1.4 Socioeconomics - Project Cost

A number of comments were received, during the scoping process, pertaining to the cost of the proposed project and the subsequent impacts to residents of the community, especially those on fixed incomes. The primary issues and concerns associated with project cost include the following:

- **The cost of the proposed project.** Several questions were raised during public scoping concerning the cost of the proposed project and the impacts of funding the project to local residents. The costs associated with the proposed reservoir enlargement and alternatives are reviewed and disclosed in the EIS.

- **The financing mechanism of the proposed enlargement.** Associated with the project cost, and receiving significant comment during the scoping process, is the financing mechanism proposed to fund the project. Concern was expressed that project implementation might result in additional taxes and/or user fees which would impact local residents, especially those on fixed incomes. Several individuals suggested that local citizens should not bear the burden of water supply costs if additional storage capacity is not needed for their immediate welfare. The philosophy that development should pay for itself (ie. - the water supply needs of future development should be paid for by that development) was expressed. The financing mechanism and the impacts to the community are examined and presented in the EIS.

- **The equity of the financing plan.** The issue of project equity was raised during the scoping process (ie. - who is paying for and who is benefitting from the project?). The project costs, financing plan, and benefits are presented and project equity is discussed.

Socioeconomic issues and concerns are evaluated in Sections 3.4 and 4.4 of this EIS.

1.8.1.5 Socioeconomics - Consequential Growth Impacts

Concern was expressed during the public comment period that expansion of the Fish Creek Reservoir would result in additional growth in the Yampa Valley. The opposing concern, that restricting the water supply would limit growth opportunities, was also presented. The primary issues and concerns associated with consequential growth impacts include:

- **Impacts of water availability on community growth.** The relationship between water supply and community growth and development are evaluated in this EIS document. The question of water storage limiting, promoting, or enabling growth is also addressed.

- **Relationship between water supply and quality of life issues.** Several questions raised during the scoping process pertained to the relationship between water availability and the quality of life within the community. Will additional water storage result in community growth and subsequent changes in lifestyle and quality of life in the community? Will limiting water storage restrict growth within the community and result in a lack of low income housing and an increased cost of living? The relationship between water storage, community growth, and the quality of life within the community is also evaluated.

Socioeconomic issues and concerns are discussed in Sections 3.4 and 4.4 of this document.

1.8.1.6 Wetlands

The impacts of the proposed project to wetlands and wildlife habitat are of concern to the public. The primary issues and concerns associated with wetlands include the following:

- **Impacts to existing wetlands in the proposed project area.** The effect of the proposed project and project alternatives on wetlands are evaluated and permitting

issues are discussed. The relationship between wetlands and proposed borrow sources are assessed.

- **Potential opportunity to enhance wetlands and wildlife habitat.** The wetlands mitigation plan is reviewed and summarized in the EIS.

Wetlands issues are addressed in Sections 3.5 and 4.5 of this EIS.

1.8.2 Other Issues

1.8.2.1 Vegetation

The potential impacts of the proposed project and project alternatives to vegetation and threatened and endangered species are evaluated (see Sections 3.7 and 4.7).

1.8.2.2 Wildlife

Concern was expressed during scoping for the protection of wildlife habitat. The potential impacts of the proposed project and project alternatives to wildlife, wildlife habitat, and threatened and endangered species are presented (see Sections 3.8 and 4.8).

1.8.2.3 Water Rights

Potential impacts of the proposed reservoir expansion and project alternatives to existing water rights are addressed (see Sections 3.3.3 and 4.3).

1.8.2.4 Water Quality

Potential impacts to the water quality of Fish Creek Reservoir and Fish Creek are analyzed. Potential impacts during construction activities and future use of the recreational facilities at the reservoir are discussed (see Sections 3.3.4 and 4.3).

1.8.2.5 Recreation

Concern was expressed during the scoping process that existing recreational facilities and resources would be impacted during the implementation of the proposed plan. Impacts to recreational facilities, including the existing camping facilities, are discussed for the proposed expansion project and for project alternatives. Impacts to the recreation resource are also discussed (see Sections 3.9 and 4.9).

1.8.2.6 Transportation

Impacts to the transportation system from construction equipment and long-term impacts, due to potential increased utilization of the reservoir area, are evaluated. Operation plans are described and mitigation measures discussed (see Sections 3.10 and 4.10).

1.8.2.7 Visual Resources

The Forest Service desires to maintain, and where possible, enhance the visual quality of the area. Visual resources are evaluated and impacts to these resources are disclosed for the Proposed Action and for all alternatives. Mitigation measures are also presented (see Sections 3.11 and 4.11).

1.8.2.8 Cultural Resources

Cultural resources are surveyed and potential impacts to these resources are evaluated and discussed for the Proposed Action and all alternatives. Results of the Class III cultural survey are presented (see Sections 3.12 and 4.12).

1.9 EIS ORGANIZATION AND FORMAT

This EIS has been organized and formatted consistent with applicable NEPA and Council on Environmental Quality (CEQ) guidelines to provide the reader with a clear understanding of the Proposed Action and alternatives, the environmental resources which may be affected, the potential environmental consequences, and the environmental review and evaluation process. This document has been formatted to simplify use with a full Table of Contents and numeric headings, designating the Chapter and section/sub-section. The following are the chapter titles for this EIS document with a brief description of chapter contents.

- **Executive Summary** - This summary highlights significant information presented in the EIS including the proposed action, alternatives considered, primary impacts, areas of concern, and affected environment.

- **Chapter 1 - Purpose of and Need for Action** - This chapter introduces the EIS document by briefly describing the Proposed Action; explaining the purpose of the EIS; identifying the agencies involved in the environmental review process, along with their roles and responsibilities; describing public involvement aspects; summarizing project issues and concerns; and presenting the scope of the analysis.

- **Chapter 2 - Alternatives Including the Proposed Action** - This chapter discusses the Proposed Action in detail; describes all alternatives considered; identifies alternatives eliminated from detailed consideration and explains why they were eliminated; and identifies management, mitigation, and monitoring measures to be considered in evaluating alternatives. This chapter also identifies the Forest Service Preferred Alternative.

- **Chapter 3 - Affected Environment** - This chapter identifies and describes existing resource values and discusses the nature and importance of these values in the context of both the project area and regional environment.

- **Chapter 4 - Environmental Consequences** - This chapter evaluates potential effects of the project proposal and alternatives; addresses the effectiveness of proposed protection/mitigation measures in limiting potential adverse effects; identifies and discusses any unavoidable adverse impacts; and describes consistency with applicable land management plans and policies.

- **Chapter 5 - List of Preparers** - This chapter identifies all agency, Applicant, and contractor personnel involved in preparation of the EIS document, along with their title and role in document preparation.

- **Chapter 6 - List of Agencies, Organizations, and Persons to Whom Copies of the Statement Are Sent** - This chapter identifies federal, state and local agencies and members of the public who have been involved in the EIS process and who have received a copy of the EIS.

- **Appendices** - The appendices provide relevant information and analytical data in support of the information, analyses, and conclusions presented in the EIS document.

- **Index** - The index provides an alphabetical key to relevant EIS topics and references their page location within the EIS.

- **Glossary** - The glossary provides the definitions of unfamiliar resource area and NEPA terms and acronyms utilized in the EIS.

- **References** - The reference list presents all published and unpublished reference sources and personal contacts used in developing the EIS. The reference list is organized in a standard bibliography format.

1.10 MODIFICATIONS TO DRAFT EIS INCORPORATED INTO THE FINAL EIS

The Final EIS was modified based upon Draft EIS comments received by the public and by reviewing agencies. Following is a list of major changes:

- Executive Summary updated

- Purpose of and Need for Action rewritten separating project modernization and benefits from purpose and need (see Sections 1.2, 1.3, and 1.4)

- A new alternative (Combination Alternative) evaluated and compared with the Preferred Alternative (see Section 2.7.3)

- A new Figure (Figure 2-6) included, showing the relocated and redesigned Granite Campground facilities

- The provisions for a potable water supply removed from the redesigned Granite Campground

- Population projections modified (use of moderate rather than high growth projections) and extended to 40-year (rather than 20-year) projections (see Section 3.3.6.2)

- Study area expanded to show 20-year and 40-year boundaries (see Section 3.3.5.1)

- Water demands and reservoir storage requirements modified to reflect 40-year projections and 1,030 AF fisheries pool (see Section 3.3.7)

- Seasonal water usage further discussed with information from the technical report incorporated into the EIS (see Section 3.3.6.3)
- Biological Assessment revised to show present and future water depletions (see Appendix J)
- Socioeconomic section expanded to include discussion of community capital improvement survey which included the reservoir expansion (see Section 3.4.6)
- DEIS Comments and Responses included as an Appendix (see Appendix A)
- Project Mitigation included as an Appendix (see Appendix K)

CHAPTER 2

PROPOSED ACTION & ALTERNATIVES



CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The purpose of this chapter is to identify and describe the alternatives (potential actions), associated with the Fish Creek Reservoir expansion proposal, including the Proposed Action and the No Action alternatives. Under NEPA, agencies must:

> *"...rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which are eliminated from detailed study, briefly discuss the reasons for their having been eliminated (40 CFR 1502.14 (a))."*

This chapter describes the alternatives selected for detailed study and identifies those alternatives eliminated from detailed study. A discussion explaining why certain alternatives were not studied in detail is included. This chapter also summarizes the environmental consequences of the alternatives analyzed in detail.

The alternatives to a Proposed Action must also include *"...reasonable alternatives not within the jurisdiction of the lead agency (40 CFR 1502.14(c))."* In meeting this intent, there are two separate sets of alternatives analyzed and described in this EIS:

a) Those alternatives from which the Forest Service has the authority to select; and

b) Those alternatives that are not within the jurisdiction of the Forest Service, but are available to the project Applicant, the City of Steamboat Springs and Mt. Werner.

The complete list of the alternatives that were available to the Forest Service to consider is listed below:

- No Action
- Fish Creek Reservoir Alternatives
  - Fish Creek Reservoir Expansion (Proposed Action)
  - Smaller Fish Creek Reservoir Expansion
  - Larger Fish Creek Reservoir Expansion
  - Fish Creek Reservoir Deepening
- Additional Fish Creek Basin Reservoir Alternatives
  - Long Lake Reservoir Expansion
  - Wren Reservoir Construction
  - Nash Reservoir Construction
- Yampa River Reservoir Alternatives
  - Stagecoach Reservoir Expansion
  - Lake Catamount Expansion
- Other Basin Reservoir Alternatives

Several of the alternatives identified have been eliminated from detailed study and are described in greater detail in Section 2.2.

Alternatives that are not within the jurisdiction of the Forest Service, but are available to the project Applicant, the City of Steamboat Springs and Mt. Werner include:

- Water Conservation
- Infiltration Gallery Expansion
- Combination Alternative (Water Conservation, Infiltration Gallery Expansion, Fish Creek Reservoir Modernization)

The Forest Supervisor may select from the range of alternatives available to the Forest Service and may also modify the alternatives by applying certain options to the alternative selected. Project alternatives analyzed in detail by the Forest Service are discussed in Section 2.3. Options available to the action alternatives are presented in Section 2.4. Section 2.5 displays a matrix comparison of the impacts associated with the alternatives analyzed in detail. Identification of the preferred alternative is made in Section 2.6. The remaining alternatives available to the Applicant are evaluated in Section 2.7.

2.2 PROJECT ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

As the analysis began, the total range of alternatives was investigated. As the analysis developed, many of the alternatives considered were eliminated from detailed study by the Forest Service, based on technical, environmental, economic, legal, and/or regulatory factors. Alternatives eliminated from detailed study are listed below:

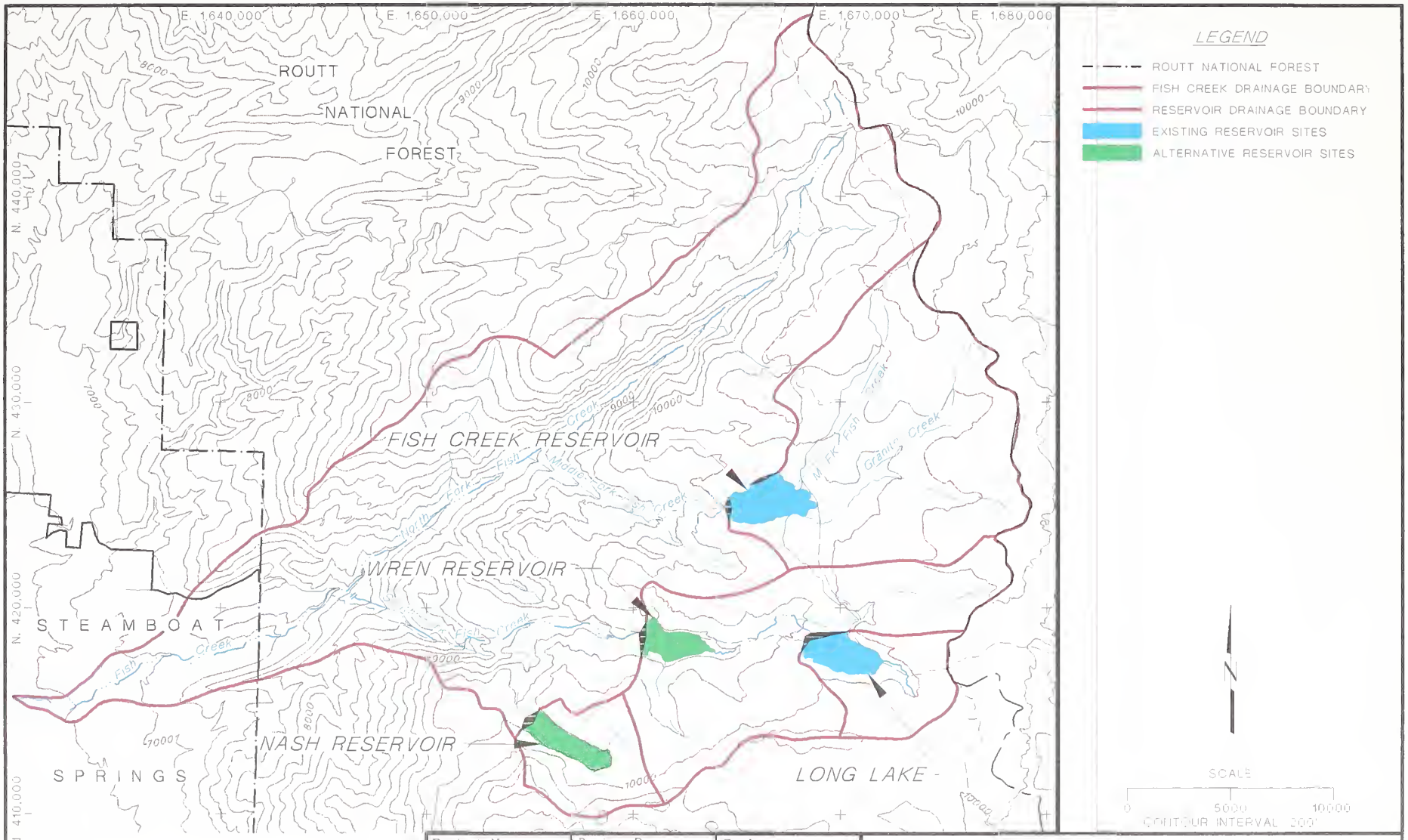
- Larger Fish Creek Reservoir Expansion
- Fish Creek Reservoir Deepening
- Long Lake Reservoir Expansion
- Wren Reservoir Construction
- Nash Reservoir Construction
- Stagecoach Reservoir Expansion
- Lake Catamount Expansion
- Other Basin Reservoir Alternatives

Following is a summary explaining the rationale for elimination of these alternatives from detailed study.

2.2.1 Larger Fish Creek Reservoir Expansion

2.2.1.1 Background

Fish Creek Reservoir is located on the Middle Fork of Fish Creek, about seven miles east of the Steamboat Springs. The reservoir currently has a storage capacity of approximately 1,842 AF and a surface water area of about 90 acres (WCC, 1992a). It is filled by snowmelt and runoff from a five square mile drainage basin. A site location map is presented in Figure 2-1, Fish Creek Basin Reservoir Alternatives.



Project No.	Design By:	Scale:
828-1500	J. RAY	SEE SCALE BAR
File:	Drawn By:	Date:
FC2RESA.DWG	T. SMITH	AUGUST 1993

FIGURE 2-1

FISH CREEK RESERVOIR EIS

FISH CREEK BASIN RESERVOIR ALTERNATIVES

The original embankment of the main dam was constructed in 1954-1955, with a spillway at the location of the existing saddle dam. The main dam was reportedly raised in the late 1950's and again in 1973. The saddle dam was constructed during the 1973 raise at the location of the original spillway (Chen, 1982).

In the early 1980's, the City evaluated a third enlargement of the existing Fish Creek Reservoir (D&D, 1983). Their evaluation was based on studies of the existing site topography, spillway location, available construction materials, storage quantities, low flow predictions and geotechnical conditions. Three alternative enlargements were investigated that would provide additional storage of 908 AF, 2,000 AF, and 3,050 AF, respectively. The 3,050 AF reservoir expansion evaluated by the City is referred to as the Larger Fish Creek Reservoir Expansion. Based on the original study performed by Dismuke and Dismuke Inc. (D&D, 1983), large scale expansion of the Fish Creek Reservoir would have the following design characteristics:

- The reservoir would have a total storage capacity of approximately 4,890 AF (an increase of approximately 3,050 AF) and cover a surface water area of about 150 acres (an increase of about 60 acres)
- Dam structures would be raised by expanding the downstream embankments with rock fill
- The main dam for the reservoir would have a total length of about 900 feet (an increase of 250 feet) and a crest height of about 79 feet (an increase of 24 feet)
- The saddle dam would have a total length of about 1,000 feet (an increase of 600 feet) and a crest height of about 42 feet (an increase of 26 feet)
- A spillway would be constructed adjacent to the saddle dam
- Borrow materials would be provided by a proposed rock quarry between the main and saddle dams and an earth-fill area south of a previous mined borrow area below the main dam

In a more recent study, the City and Mt. Werner evaluated a 2,280 AF increase in the storage capacity of Fish Creek Reservoir (WCC, 1992a). This is the Applicant's Proposed Action (Alternative B) in the EIS, and is discussed further in Section 2.3.2.

2.2.1.2 Basis for Elimination

The Larger Fish Creek Reservoir Expansion was examined initially as a viable alternative. However, as the analysis proceeded, several factors became apparent that caused the Forest Service to eliminate it from detailed study. The increased storage capacity provided by this alternative would exceed the purpose of and need for the Proposed Action (Alternative B). Additionally, past studies indicate that the unit cost ($/AF) for the construction of the larger expansion is greater than the unit cost of the proposed expansion under Alternative B. The Larger Fish Creek Reservoir Expansion would also result in impacts to an estimated 30 acres of wetlands. These wetlands would potentially be impacted, either by inundation or by removal of material from borrow areas. A section of the dam access road would be inundated and a new road would have to replace the inundated area to provide access to a trailhead and the main and saddle dams.

2.2.2 Fish Creek Reservoir Deepening

To reduce the amount of wetlands potentially impacted by reservoir expansion, it was proposed at a public scoping meeting that Fish Creek Reservoir be deepened to increase its storage capacity. Under Alternative B, some deepening of the existing reservoir is projected to occur in the proposed borrow areas. Geotechnical analyses indicate, however, that the bedrock nature of the reservoir precludes its deepening to the extent required to meet the storage needs of the Applicant.

Geotechnical explorations in the reservoir area have identified bedrock, at or near the surface. The excavation of the bedrock, as part of a reservoir deepening program, would require drilling and blasting operations to properly fragment the rock for disposal. Blasting of the bedrock within the reservoir would result in noise and flyrock conditions. Excavated materials would have to be removed from the site.

Blasting within the reservoir could also increase fracture flow conditions and, therefore, decrease water volume within the reservoir due to vertical infiltration into the underlying bedrock. Due to the engineering difficulty and viability of this action, this alternative was eliminated from further consideration.

2.2.3 Long Lake Reservoir Expansion

2.2.3.1 Background

Long Lake Reservoir is located on a tributary to Fish Creek, about seven miles east of Steamboat Springs. This reservoir has an active storage capacity of about 400 AF and a surface water area of approximately 60 acres (Birch, 1992a). A site location map is presented in Figure 2-1, Fish Creek Basin Reservoir Alternatives.

The dam for the reservoir is about 475 feet in length with an average height of 9 feet. The spillway channel is about 10 feet wide, with an effective width of several hundred feet. This dam and spillway were reportedly constructed before the Fish Creek Reservoir was built and, since that time, have had various repairs and additions. The most recent repairs occurred in the Fall of 1986. During this time, the dam crest was reshaped and lowered to a uniform height and the reservoir embankments were flattened and/or filled. In addition, the access road between Fish Creek and Long Lake Reservoirs was restored and sections were upgraded (D&D, 1986).

The City currently uses the Long Lake Reservoir to augment their water supply. In addition, Long Lake Reservoir acts as a backup water source when Fish Creek Reservoir requires maintenance (Birch, 1992a).

2.2.3.2 Basis for Elimination

Long Lake Reservoir was not considered for detailed study by the Forest Service for the following reasons:

- The relatively small drainage area that fills the reservoir (0.71 square miles), is insufficient to meet the purpose and need of the Proposed Action
- Due to its long dam crest, reservoir expansion would be technically difficult and economically prohibitive

- Wetlands impacted would be greater than those impacted under the Proposed Action
- Flow through Fish Creek Falls would be impacted

2.2.4 Wren Reservoir Construction

2.2.4.1 Background

The Wren Reservoir site is located in the upper part of the Fish Creek drainage, about four miles east of the City as shown in Figure 2-1, Fish Creek Basin Reservoir Alternatives. A field inspection of the reservoir site was made in August 1983, by Mt. Werner and its engineer. Based on the 1983 field visit, the following general information was collected regarding the Wren site and the design of a potential reservoir:

- The drainage basin covers an area of approximately 4.8 square miles and ranges in elevation from about 10,400 feet at the upper reaches to 9,480 feet at the dam site
- About 70 to 80 percent of the basin is wooded
- The dam for the reservoir would be about 180 feet in length at the base, 600 to 800 feet long at the crest, and 60 to 80 feet in height
- A spillway would be provided by development of small side drainage about 500 feet south of the embankment or construction of a concrete spillway
- The reservoir would have a storage capacity of approximately 3,210 AF
- Access would be provided by improving an existing road from Fish Creek Reservoir to Long Lake, regrading an old road from Long Lake, and constructing 1/2 mile of new road to the reservoir
- Likely soil borrow areas exist along side slopes of the proposed reservoir and on the ridge above the north abutment of the dam (D&D, 1983)

2.2.4.2 Basis for Elimination

The Forest Service has eliminated development of the Wren Reservoir Site from detailed study for the following reasons:

- The site is presently undeveloped and unimpacted
- A relatively large area of wetlands (approximately 30 acres) would be inundated
- Flow through Fish Creek Falls would be impacted
- Access would be difficult and a heavily-used recreation trail would be inundated
- An unroaded setting would be converted to a developed site

2.2.5 Nash Reservoir Construction

2.2.5.1 Background

The Nash Reservoir site is located on a tributary of the South Fork of Fish Creek, about five miles east of the City, as shown on Figure 2-1, Fish Creek Basin Reservoir Alternatives. It occurs in a small glacial valley just below the Steamboat Ski Area.

Development of a reservoir at this site was first proposed to the Forest Service in November 1968. In June 1971, an application was submitted again to construct a reservoir on Forest Service lands, but was denied at that time, based on the findings presented in a Forest Service Environmental Analysis Report (EAR). The EAR, completed in June 1973, identified several items that needed further analysis by the Applicant, including a larger reservoir design to meet fishery concerns; evaluation of the watershed potential and low flow requirements; and the construction of an access road (Reed, 1990).

Additional applications were submitted to the Forest Service in June 1980 and May 1987. The 1987 application proposed a much larger reservoir at the site than the previous designs and included construction of an access road and an analysis of cultural and wetland resources. In 1989, the Forest Service concluded that the following concerns needed to be addressed:

- Updated estimate of construction and maintenance costs
- A project need (identification of potential market(s) for the water)
- A cost/benefit analysis for the project
- Submittal of a 404 permit application with the U.S. Army Corps of Engineers (Reed, 1989)

According to the Forest Service, no analysis on developing this reservoir is being prepared at this time (Reed, 1990).

Based upon the 1987 Special Use Application submitted to the Forest Service, the proposed Nash Reservoir would have the following design characteristics:

- The dam for the reservoir would be about 500 feet in length and 35 feet in height and have a storage capacity of 760 AF
- The reservoir would inundate approximately 30 to 40 acres of National Forest Land with soil borrow areas below the high water line
- The dam structure would consist of earth fill embankments faced with rock and drainage would be provided by a bottom-water overflow outlet
- A 1.25 mile access road would be constructed from the existing road which services the Steamboat Ski Area and the transmission tower atop Mt. Werner

2.2.5.2 Basis for Elimination

The Forest Service has eliminated development of the Nash Reservoir Site from detailed study in this EIS for the following reasons:

- The site is presently undeveloped and unimpacted
- The 760 AF storage volume would not meet the proposed purpose and need
- A larger amount of wetlands would be inundated than under the proposed action
- Flow through Fish Creek Falls would be impacted
- Access would be extremely difficult
- The Applicant does not own any water rights to the proposed Nash Reservoir

2.2.6 Stagecoach Reservoir Expansion

The Stagecoach Dam, constructed in the summer of 1988, was designed to meet the agricultural water demands of the Upper Yampa Water Conservancy District (UYWCD), and as a recreational facility. The dam is a roller compacted concrete (RCC) structure 145 feet high and 360 feet long. To enhance the downstream fishery in the Yampa River, the dam includes a multi-level intake tower that pulls water from various depths in the reservoir. The reservoir has a storage capacity of 33,275 AF. Both the City and Mt. Werner lease storage rights in Stagecoach Reservoir primarily as a back-up water source to the Fish Creek basin water.

2.2.6.1 Basis for Elimination

The Stagecoach Reservoir Expansion was eliminated from detailed analysis by the Forest Service because construction activities have recently been completed at the reservoir site and virtually new facilities would be inundated by an expansion. The intake of water from Stagecoach Reservoir to the City and Mt. Werner's water system would likely be through the existing infiltration galleries. This would require expansion of the infiltration galleries, and subsequently, expansion of the water treatment and distribution facilities. Additionally, due to water quality concerns, both the City and Mt. Werner have minimized the use of the infiltration galleries. These concerns are discussed further in Section 2.7.2.

2.2.7 Lake Catamount Expansion

2.2.7.1 Background

Lake Catamount, constructed in 1977-1978, is a privately-owned lake, utilized primarily for recreational purposes. It is integral to the proposed Lake Catamount Resort development and, therefore, is not available as a water source to the City or Mt. Werner.

2.2.7.2 Basis for Elimination

The Applicant has no water storage rights to Lake Catamount. For this reason, this alternative was eliminated from further consideration by the Forest Service. As the water intake for this alterative would likely be through the infiltration galleries, the concerns expressed in Section 2.2.6 and in Section 2.7.2, associated with the expansion of the infiltration galleries, are also relevant to this alternative.

2.2.8 Other Basin Reservoir Alternatives

2.2.8.1 Background

In 1990, the Colorado River Water Conservation District (CRWCD) began a study of alternative water storage supply locations in the Yampa River Basin (Hydrosphere, 1990). Potential reservoir sites were considered, based on their ability to serve both near-term (25-year) and long-term (50-year) demand projections. A near-term site was proposed in the Craig, Colorado area to provide storage and recreation, with a long-term site located in the upper part of the basin to retain water rights for future in-basin uses (CRWCD, 1991a).

A total of 64 reservoir sites were initially identified by the CRWCD through review of previous studies, examination of topographic maps of the area, and discussions with local water supply experts (CRWCD, 1991a). The original sites underwent a screening process to identify sites to be analyzed in further detail. Screening criteria specified that the reservoir must have sufficient inflow and topography to support a minimum reservoir size of 20,000 AF; must be outside of habitat areas of threatened and endangered fish species; and must not have obvious engineering and environmental flaws (CRWCD, 1991b). At a public meeting held in Craig in July 1992, it was recommended that five of these sites be given further consideration:

- Elkhead Reservoir Expansion
- Williams Fork near Hamilton
- East Fork
- Elk Creek
- Stagecoach Reservoir Expansion

Enlargement of the existing Stagecoach Reservoir, not originally identified by the CRWCD as an alternative site, was added in response to public comment.

2.2.8.2 Other Basin Reservoir Alternatives Considered for this Proposal

For the purpose and need stated in this EIS, only three of the reservoir sites identified by the CRWCD study are relevant:

- Walton Creek
- Fish Creek Reservoir Expansion
- Stagecoach Reservoir Expansion

Two of these sites (Walton Creek and Fish Creek) were in the original CRWCD list of 64 potential reservoir sites. Stagecoach Reservoir is the only one of these three sites on the final list being considered by CRWCD.

2.2.8.3 Basis for Elimination

Walton Creek is eliminated from detailed study by the Forest Service primarily because of the anticipated expense of reservoir construction and of water conveyance and treatment. CRWCD has estimated that active storage in a reservoir on Walton Creek would cost approximately $6,500 per AF compared to a cost of approximately $2,600 per AF for the proposed Fish Creek Reservoir Expansion (CRWCD, 1992). Expansion of Stagecoach Reservoir is discussed in Section 2.2.6.

Development of reservoir sites within the Fish Creek basin are described in several sections within this chapter.

2.3 PROJECT ALTERNATIVES ANALYZED IN DETAIL BY THE FOREST SERVICE

The following alternatives were considered in detail by the Forest Service. These alternatives are available for selection by the Forest Supervisor:

- Alternative A - No Action
- Alternative B - Fish Creek Reservoir Expansion (Proposed Action)
- Alternative C - Smaller Fish Creek Reservoir Expansion

Alternatives analyzed and available to the Applicant include:

- Water Conservation
- Infiltration Gallery Expansion
- Combination Alternative (Water Conservation, Infiltration Gallery Expansion, Fish Creek Reservoir Modernization)

Alternatives available to the Forest Service are discussed below and those available to the Applicant are described in Section 2.7.

2.3.1 Alternative A - No Action

2.3.1.1 Background

NEPA requires that a No Action Alternative be considered in all environmental documents. This alternative serves as the baseline for estimating the impacts of the other alternatives presented in the EIS. For the purposes of this analysis, the No Action Alternative describes the current condition of the reservoir. Under this alternative, a new Special Use Permit would not be granted by the Forest Service to expand the existing Fish Creek Reservoir and the City would continue to operate the reservoir under its existing Special Use Permit. In this instance, the No Action Alternative would require that the Applicant consider other means of meeting projected water demands and storage requirements, and providing in-stream flow. As discussed in Section 2.7, implementation of water conservation measures, expansion of the existing infiltration galleries, and a combination of these actions, are alternatives available for implementation by the Applicant.

Under the No Action Alternative, the existing dam structures, reservoir, and ancillary facilities would remain virtually unchanged. As shown in Figure 2-2, Alternative A - No Action, the reservoir is impounded by two embankments, the main dam and the saddle dam. The main dam is a homogeneous earth-fill embankment with a maximum height of 55 feet and a crest length of about 650 feet. The saddle dam, located northeast of the main dam, is a zoned earth-fill embankment with a maximum height of about 16 feet and a length of approximately 400 feet. The spillway for the reservoir is located at the right abutment of the saddle dam, providing capacity for both service and emergency flows. The existing outlet conduit is located at the main dam and consists of a 24-inch diameter steel pipe with an upstream control gate (Chen, 1982).

2.3.1.2 Environmental Consequences

Environmental consequences include all physical, social, economic, cultural, recreational, and visual impacts associated with the implementation of an alternative. Assuming that the No Action alternative describes the current condition of the reservoir, and that no corrective action has yet been taken by the Forest Service under the terms of the existing permit and/or operating plan, the environmental consequences associated with the implementation of the No-Action Alternative include the following:

- No impact to wetlands
- Continued erosion of Puppy Dog Lake drainage
- No additional water supply or storage capacity; Mt. Werner would have to develop and/or utilize alternative water supplies to meet immediate and long-term water demands; the City would also have to investigate alternative supply sources to meet projected long-term water demands
- No power supply source to the site
- No remote operational control of the raw water system; the reservoir would continue to be operated manually, on-site
- No early warning system to alert City and residents of dam safety conditions
- No in-stream flow augmentation and control; lower reaches of Fish Creek would continue to be reduced to periodic low-flow or no-flow conditions
- No long-term fisheries pool for maintenance of fisheries, recreational activities, and scenic beauty
- Potential impact on socioeconomic climate if lack of water restricts growth
- Continued use of existing service roads
- Continued use of existing campground facilities
- No debt incurred by City or Mt. Werner
- Expenditures to date of approximately one million dollars (for analysis and design of the Proposed Action) would be lost

A further examination of impacts is presented in Section 2.5, Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

2.3.1.3 Potential Mitigation

The Forest Service could modify the existing Fish Creek Reservoir permit and/or operating plan to address the environmental consequences of the No Action Alternative. Potential mitigation under the No Action Alternative could include:



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FIGURE 2-2

FISH CREEK RESERVOIR EIS

ALTERNATIVE A
NO ACTION ALTERNATIVE

- Enlargement of outlet pipe in main dam to help reduce flows through Puppy Dog Lake channel
- Erosion protection in the Puppy Dog Lake drainage
- Repair of channel degradation below Puppy Dog Lake
- Upgrade of service roads
- Recommendation for design and implementation of early warning and remote operational control systems

At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event, however, that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further addressed by the Forest Service under the existing permit.

2.3.2 Alternative B - Proposed Reservoir Expansion (Proposed Action)

2.3.2.1 Background

The present design and operation of the Fish Creek Reservoir is discussed briefly under the No Action Alternative and in more detail in Section 3.2 (Dam Safety/Flood Hazard) and Section 3.3 (Water Resources). The City and Mt. Werner recently evaluated a 2,280 AF increase in the storage capacity of the reservoir (WWC, 1992a&b). This increase in storage capacity is the Proposed Action (Alternative B) in the EIS, and is shown in Figure 2-3, Alternative B - Fish Creek Reservoir Expansion (Proposed Action).

2.3.2.2 Reservoir Design

Based on the studies performed by Woodward-Clyde Consultants (WCC, 1992a&b), Alternative B would have the following basic design characteristics:

- The reservoir would have a total storage capacity of approximately 4,122 AF (an increase of 2,280 AF) and cover a surface water area of about 140 acres (an increase of approximately 50 acres)
- The main dam for the reservoir would be raised by removing a top portion of the existing structure and constructing new fill on the upstream of the existing embankment
- The main dam would have a total length of about 830 feet (an increase of 180 feet) and a crest height of about 75 feet (an increase of 20 feet)
- The existing saddle dam would be removed and replaced with an earth fill embankment with a total length of about 1,060 feet (an increase of 660 feet) and a crest height of about 40 feet (an increase of 24 feet)
- An 80-foot wide spillway would be cut into bedrock on the right abutment of the new saddle dam

- A new, high level outlet works would be constructed for normal reservoir operation and, along with the existing outlet, would provide a means of draining the reservoir during an emergency. The existing outlet pipe would be extended and rehabilitated. The outlet works would be operated to reduce flow into the Puppy Dog Lake drainage during spring runoff

The proposed reservoir expansion under Alternative B, would involve complete drawdown of the reservoir and diversion of Granite Creek during construction. Construction would be completed in two summer construction seasons.

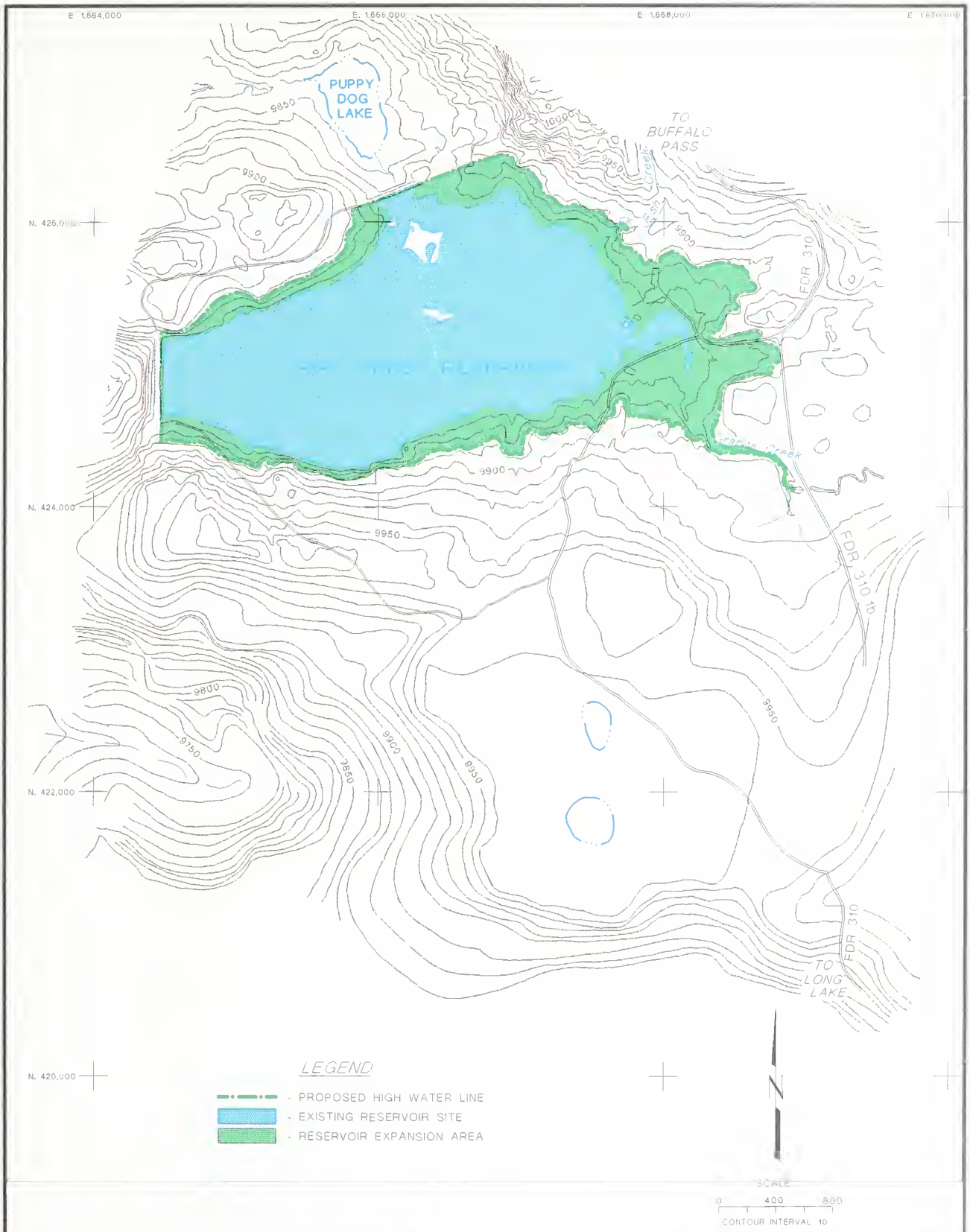
Integral to the dam design is the installation of a remote operational control system. The existing Fish Creek Reservoir is situated in a remote location which is practically inaccessible from November through June each year. Releases from the reservoir are currently made by manual adjustments to the outlet gate. Under the best conditions, this requires about a half day to complete. Adjustments are not possible under adverse conditions, resulting in reservoir releases in excess of actual demands. The remoteness and inaccessibility of the reservoir also hinder detection, and possibly correction, of problems that could threaten the structural integrity of the dams. To correct these deficiencies, the Applicant proposes to install a system that allows remote operation of the outlet works of the reservoir. In addition, a remote data acquisition system would be installed to provide adequate warning of problems that arise that could threaten the integrity of the structures. This system would monitor the internal pressures of the main dam and saddle dam, and would measure the flow downstream from these structures. An electric underground powerline would be installed to provide power to the early warning and remote operational control systems.

The estimated cost of Alternative B is $6,000,000, which equates to a unit cost (cost per AF of water) of approximately $2,600/AF. Funding for this proposal would be shared by the City and Mt. Werner, with the City financing 25% and Mt. Werner financing 75% of the total cost.

2.3.2.3 Environmental Consequences

The environmental consequences associated with the implementation of Alternative B include the following:

- Loss of approximately 15 acres of wetlands.
- Disturbance and loss of upland meadows, mixed conifer forests, and previously undisturbed areas.
- Increased capability to detect and remediate problems with the dams due to the installation of an early warning monitoring system.
- Remote operation of reservoir outlet structure to respond to any detection of imminent dam failure and provide year-around operation capability.
- Correction of erosion problems currently associated with Puppy Dog Lake drainage.
- Ability to store additional water and meet long-term future water demands for the City and Mt. Werner.



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FIGURE 2-3

FISH CREEK RESERVOIR EIS

ALTERNATIVE B
FISH CREEK RESERVOIR EXPANSION (PROPOSED ACTION)

- Augmentation of in-stream flows below the intake to the water filtration plant; Fish Creek would remain a live, year-round stream to the confluence with the Yampa River.

- Increase in high mountain lake aquatic habitat and reduction of stream habitat for fish at the reservoir site.

- Maintenance of a 1,030 AF fisheries pool in the reservoir.

- Minor depletion of water for downstream endangered fish species habitat.

- Relocation and upgrading of Granite Campground with improved accessibility for the physically disabled.

- Upgrading of service roads.

- Temporary impacts to road conditions and transportation safety along Buffalo Pass Road and site access roads during construction.

- Temporary displacement of Fish Creek Reservoir visitors and other recreationists in the area during construction; Granite Campground would be unavailable until relocated and rebuilt.

- Temporary impacts to fishery during construction; reservoir would be drained and no fishery would be sustained during the proposed two-year construction period.

- Debt obligation for the City and Mt. Werner for the $6,000,000 expansion; cost would be shared between the City (25%) and Mt. Werner (75%).

A further examination of impacts is presented in Section 2.5, Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

2.3.2.4 Potential Mitigation

In the event that Fish Creek Reservoir is expanded under Alternative B, a number of mitigation efforts would be required. A more comprehensive mitigation plan has been developed between the Draft EIS and the Final EIS (see Appendix K, Project Mitigation). Mitigation would include, but not be limited to, the following:

- Wetlands which would be disturbed by the expanded shoreline, borrow areas, and new transportation routes would be restored or replaced according to requirements of COE Section 404 (c) permit guidelines.

- Soil resources which would be affected by construction-related activities would be reclaimed through soil reclamation programs. Disturbed areas above the high water line would be revegetated.

- Authorized activities within the construction area would be limited under the terms of the Special Use Permit (ie. firearms, firewood, fishing limits, etc.).

- Granite Campground (including the campsites, parking area, picnic tables, etc.) would be relocated above the new high-water line, and designed such that potential campground-related impacts to the water quality of the reservoir would be minimized and the recreational experience enhanced. This facility would comply with the Uniform Federal Accessibility Standards of the Americans with Disabilities Act (ADA) and would be designed to Forest Service standards.

- In order to minimize the probability of an automobile, hiker, or bicycle accident along FDR 60 and 310, safety measures would be implemented during the mobilization of heavy equipment and the transportation of supply vehicles to and from the project site (a discussion of safety measures appears in Section 4.10, Transportation).

- An approved emergency hazardous waste spill response plan (describing procedures to be implemented in case of a fuel or hazardous waste spill) would be submitted by the Applicant before any fuel or hazardous material is transported over the West Route. A similar plan would be prepared for utilization of explosives.

- To minimize the impacts to the road conditions along County access roads and the West Route, the Applicant would submit and implement a road maintenance plan which ensures that the surface of the roads are returned to the same or better condition as they were prior to the transportation of construction-related equipment.

- Under Alternative B, water conservation would also be encouraged by the Forest Service and the Applicant.

- Visual mitigation would be incorporated into the design and, where possible, the visual aspects of the project (including structures, parking areas, roads, borrow areas) would be improved to meet the visual quality objectives of the Forest Service.

2.3.3 Alternative C - Smaller Reservoir Expansion

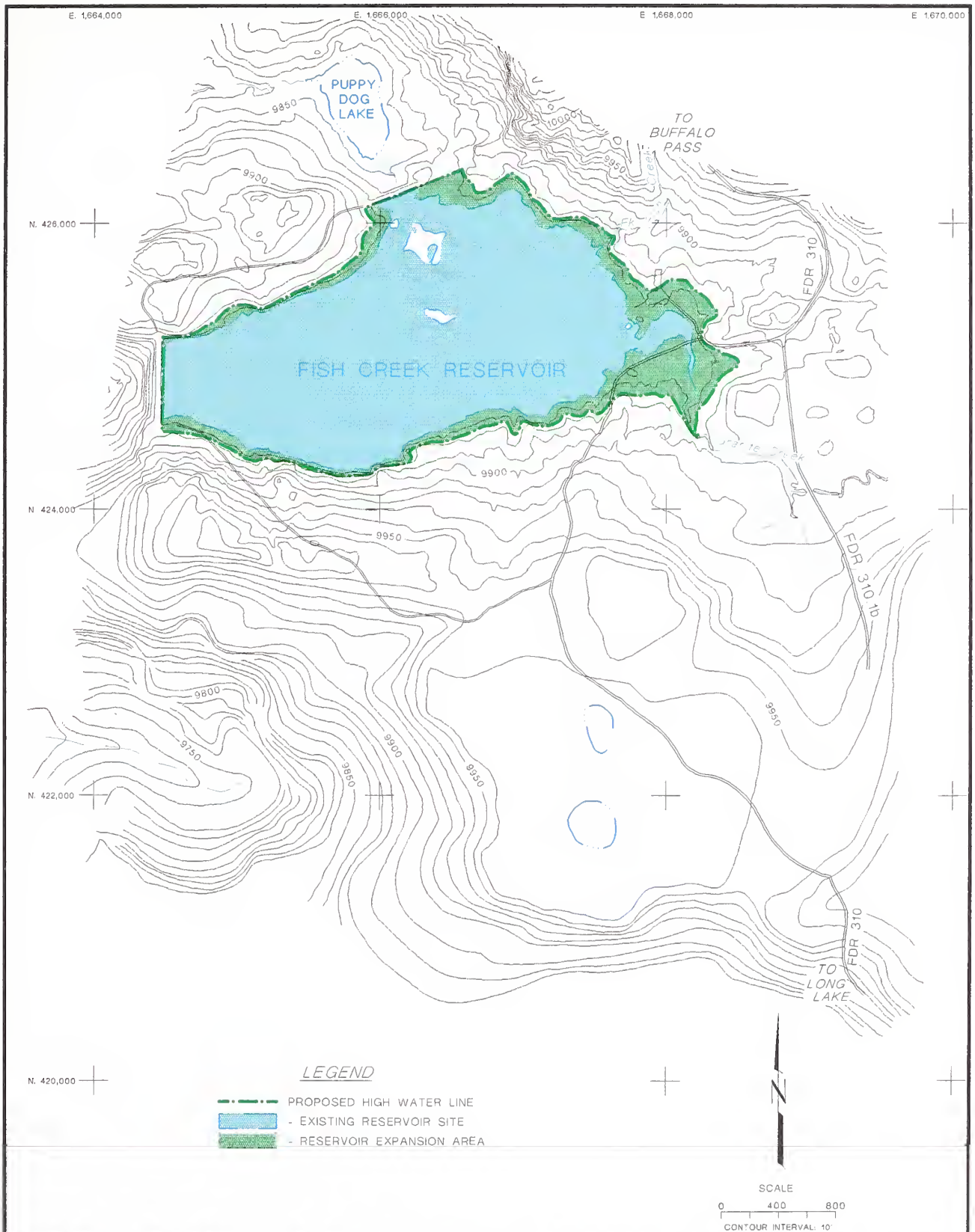
2.3.3.1 Background

As previously stated, in the early 1980's, the City evaluated three alternative increases in the storage capacity of the existing Fish Creek Reservoir: 908 AF, 2,000 AF, and 3,050 AF (D&D, 1983). The 908 AF increase in storage capacity is referred to in this document as Alternative C - Smaller Reservoir Expansion, and is shown in Figure 2-4, Alternative C — Smaller Reservoir Expansion.

2.3.3.2 Reservoir Design

Based on the study performed by Dismuke and Dismuke (D&D, 1983), Alternative C would have the following basic design characteristics:

- The reservoir would have a total storage capacity of 2,750 AF (an increase of 908 AF) and cover a surface water area of about 112 acres (an increase of about 22 acres)



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FIGURE 2-4

FISH CREEK RESERVOIR EIS

ALTERNATIVE C SMALLER RESERVOIR EXPANSION

- Dam structures would be raised by expanding the downstream embankments with earth fill (in contrast to primarily rock fill as proposed for the large scale expansion)
- The main dam for the reservoir would have a total length of about 750 feet (an increase of 100 feet) and a crest height of about 63 feet (an increase of 8 feet)
- The saddle dam would have a total length of about 800 feet (an increase of 400 feet) and a crest height of about 26 feet (an increase of 10 feet)
- A spillway would be constructed adjacent to the saddle dam

2.3.3.3 Environmental Consequences

The environmental consequences of Alternative C are the same as Alternative B with the following exceptions:

- 8.80 acres of wetlands would be impacted
- Mt. Werner and the City would have to develop additional water supplies to meet projected long-term water demands
- The additional water supply would not be of the same water quality as the water from Fish Creek
- The total financial obligations for reservoir expansion ($4,200,000) would be less than under Alternative B
- The cost of construction per AF of water would be $4,600/AF
- Potential impacts to the socioeconomic climate of the community could result if the lack of water resources restricts growth
- A long-term fisheries pool may not be possible
- Future in-stream flow augmentation may be reduced, or not possible, during certain times of the year

A further examination of impacts is presented in Section 2.5, Comparison of Alternatives Analyzed in Detail and in Chapter 4, Environmental Consequences.

2.3.3.4 Potential Mitigation

In the event that a smaller expansion of Fish Creek Reservoir is permitted, mitigation would be identical to that required for the proposed expansion under Alternative B. Under Alternative C, the implementation of water conservation programs would also be encouraged by the Forest Service and the Applicant.

2.4 OPTIONS AVAILABLE TO THE FISH CREEK RESERVOIR EXPANSION ALTERNATIVES ANALYZED IN DETAIL BY THE FOREST SERVICE

Specific options to the proposed reservoir expansion and the smaller expansion alternatives (Alternatives B and C) were identified during the scoping process. These options include the following:

- Power supply
- Campground relocation sites
- Service roads
- Borrow areas

These options are described in the following paragraphs, and shown in Figure 2-5, Ancillary Facilities. At this time, the underground electric power supply option has been determined to be the most reliable power source for the proposed and smaller reservoir expansions. The two other power supply options have, therefore, been eliminated from further consideration and rationale is provided for elimination.

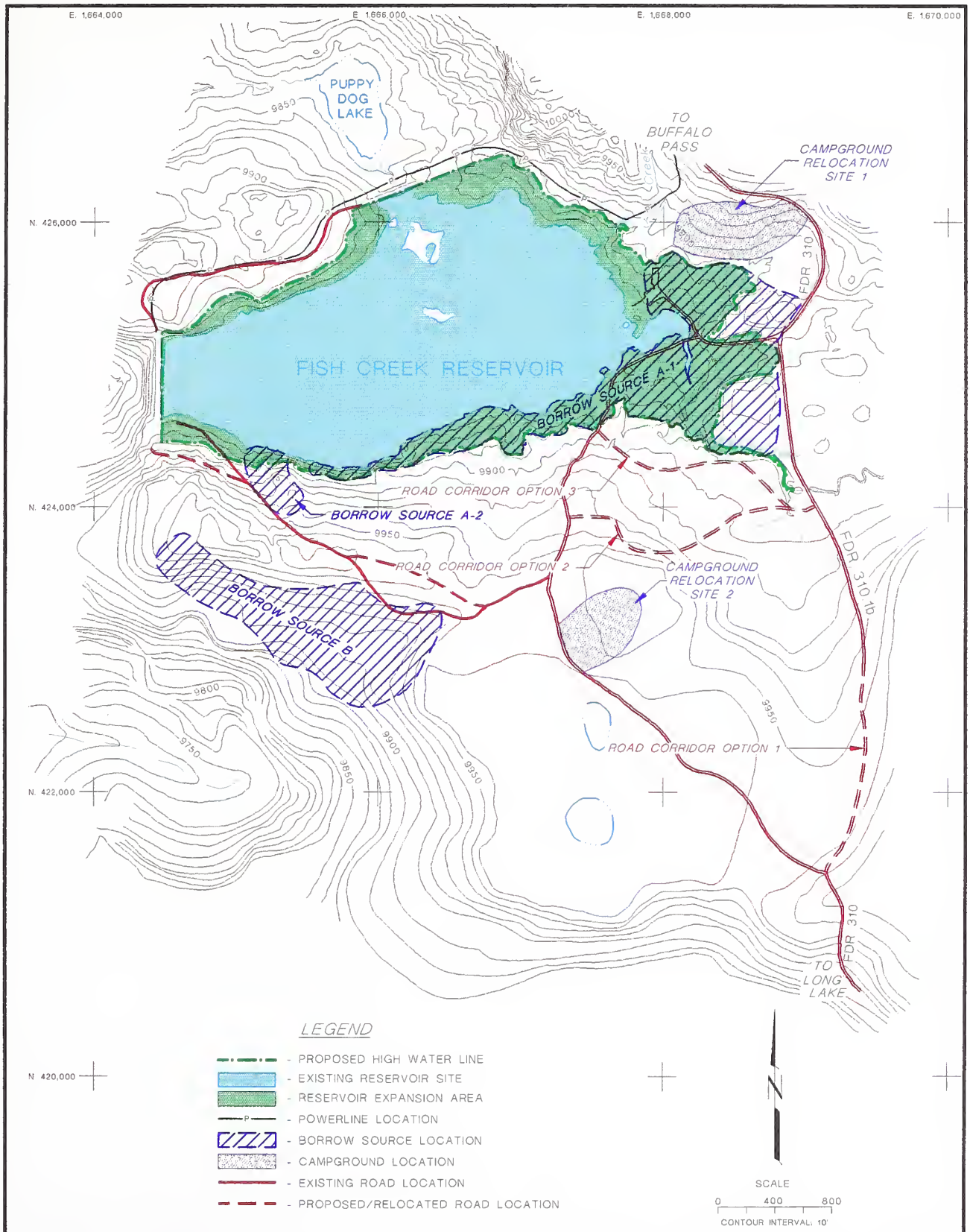
2.4.1 Power Supply Options Considered

No power supply would be installed under the No Action Alternative. For the proposed (Alternative B) and smaller (Alternative C) reservoir expansions, the power supply needed to operate the remote reservoir control system and the early warning system, could be supplied by one of three sources:

- Electric
- Solar
- Propane

The City and Mt. Werner are proposing an electric powerline to the site to meet the power demands of the proposed early warning and remote operation systems. The electrical service would also be utilized during construction activities. The proposed design includes an underground 7,200 volt service to the Fish Creek dam and potential campground site. The alignment of the power line is shown in Figure 2-5, Ancillary Facilities. The power cable, which is encased in flexible conduit, would be placed in the existing roadway and would be buried in a 30-36 inch deep trench. A 7,200 volt service, provided by Yampa Valley Electric Association (YVEA), is presently available adjacent to the Summit Lake - Fish Creek roadway at the point where the Hayden-Cheyenne hi-line crosses the road. The total distance to the proposed control house is approximately 19,000 feet (3.71 miles). Approximately every 1,250 feet, a small green cubicle would be installed by the side of the road for grounding purposes and access to the cable.

Another power option considered includes photovoltaic solar collectors. The principle involved is the conversion of heat from the sun into electrical energy. For example, a photovoltaic generator 16 feet wide and 12 feet high will generate, when the sun is shining, about 1.44 kilowatts used to charge 24 volt batteries. Stored energy from the batteries would theoretically provide the power to drive a remote warning system and to operate the 36-inch dam outlet valve. Reliability of this system is of major concern. It depends on the solar resource at the Fish Creek Dam which is predicted to be about 30 percent of a comparable installation in sunny New Mexico. Secondly, the amount of power required to operate a 10 horsepower motor-operated gate operator is difficult to



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FIGURE 2-5

FISH CREEK RESERVOIR EIS

ANCILLARY FACILITIES (ALTERNATIVES B & C)

obtain from even a large bank of batteries. These batteries can be unreliable at sub-zero temperatures. In addition, the collector might be considered visually objectionable and it could easily be damaged.

Propane is another power source option considered. This system would require an internal combustion engine driving a relatively large generator with an output rating of 20 to 25 kilowatts. Batteries, subject to below zero temperatures, would be required for starting the engine. Batteries under these conditions, coupled with the requirement to start the motor-generator by remote control by radio, would not provide the reliability essential to this application. Additionally, a 1,000-gallon high-pressure liquid propane storage tank would be visually objectionable. Concerns over temperature fluctuation, storage, and public safety would limit the usefulness of propane in this application.

As stated previously, the underground electric power supply option has been determined to be the most reliable power source for the proposed and smaller reservoir expansions. The solar and propane options have, therefore, been eliminated from further consideration.

2.4.2 Campground Relocation Site Options

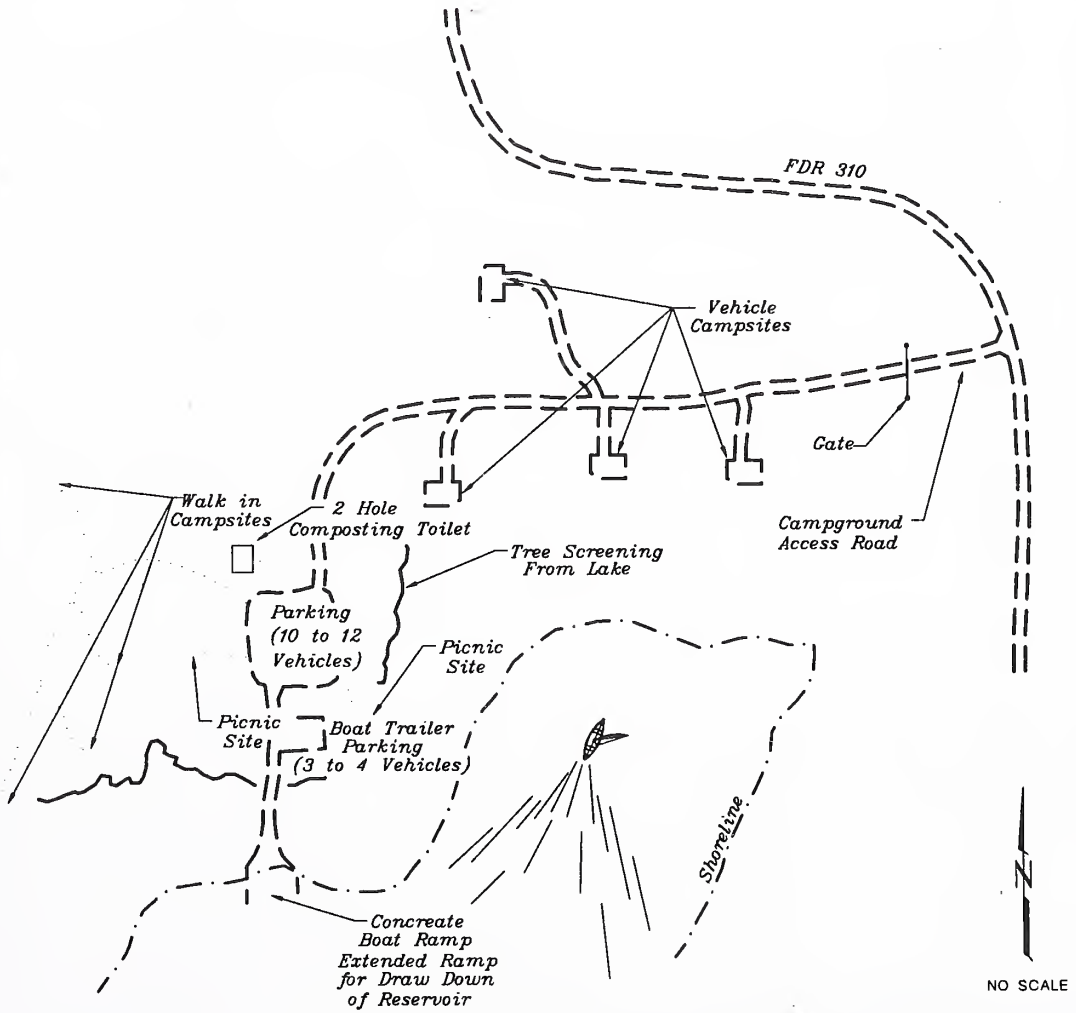
As part of both Alternative B and Alternative C, the existing Granite Campground would be replaced by an upgraded camping area in one of two potential locations, as shown in Figure 2-5, Ancillary Facilities. Campground Relocation Site 1, is on the northeast shoreline of the expanded reservoir, near the site of the existing campground. Campground Relocation Site 2 is on the south side of the reservoir. Under the No Action Alternative, the campground would not be relocated. The new campground in either location, under Alternatives B or C, would provide the following facilities:

- Two-way entrance road
- Double lane camping access road
- 10-12 vehicle gravel parking lot
- 4 tent sites with 4 or more future sites
- 4 vehicle access sites with 4 future sites
- 2 picnic sites
- Concrete boat ramp
- Composting toilet
- Facility would comply with the Uniform Federal Accessibility Standards of the ADA where applicable

The proposed campground configuration at the Forest Service preferred site is shown in Figure 2-6, Granite Campground.

2.4.3 Service Road Options

No new service roads to the main dam would be constructed under Alternative A (No Action Alternative). For Alternatives B (Proposed Action) and C (Smaller Reservoir Expansion), three alternative road options have been proposed to route FDR 310.2 around the proposed reservoir. All three road options are shown on Figure 2-5, Ancillary Facilities.



LEGEND

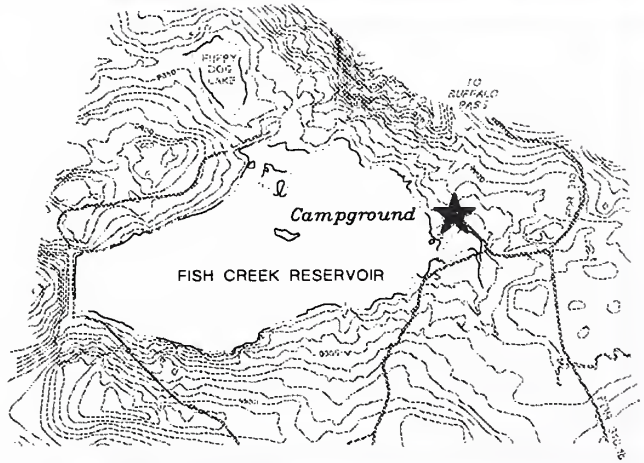
CLASS IV TRAILS

ROADS

SHORELINE

NOTES

1. ALL CAMPSITES LOCATED TO PROVIDE SECLUSION & SOLITUDE.
2. VEHICLE CAMPSITES DESIGNED TO ACCOMODATE TRUCK CAMPERS.
3. ALL CAMPSITES BARRIER FREE & FULLY ACCESSIBLE
4. LEVEL IV TRAILS FULLY MEET ADA STANDARDS FOR ACCESSIBILITY FOR ALL.



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FIGURE 2-6

FISH CREEK RESERVOIR EIS

GRANITE CAMPGROUND

Road Option 1 would start at the end of FDR 310.1B and continue south until it reaches FDR 310.2. The proposed road would be constructed through the trees approximately 200 feet from the open meadow.

Road Option 2 would branch off of FDR 310.1B just south of Granite Creek and continue southwest across the meadow until it reaches FDR 310.2.

Road Option 3 would also branch off of FDR 310.1B just south off Granite Creek and would continue west just above the proposed water line until it reaches FDR 310.2

Other proposed transportation plans for Alternatives B and C include the realignment and upgrade of the two track, four-wheel drive access road from FDR 310.2 to the dam and saddle dam. The road would be realigned to bypass environmentally sensitive meadows. Upgrading would include regrading and the addition of drainage structures and gravel.

2.4.4 Borrow Areas

There would be no need to utilize borrow areas under the No Action Alternative. An estimated 300,000 cubic yards of borrow material would be required to expand the Fish Creek Reservoir under Alternative B. Approximately 200,000 cubic yards of borrow material would be required for the smaller reservoir expansion (Alternative C).

Previous studies (WCC, 1991) have identified three potential borrow source areas for embankment material. These areas are identified by A-1, A-2, and B and are shown in Figure 2-5, Ancillary Facilities. According to Woodward-Clyde (WCC, 1992b), Borrow Area A-1 and the current reservoir basin would be utilized as the primary source of embankment material. Borrow Area B could be utilized as a supplemental source of embankment material, if additional material is required or if the moisture content of the material in Borrow Area A-1 is too high. Borrow Area A-2 could be utilized as quarry for additional riprap material, if required. The proposed plan is to utilize borrow material within the enlarged reservoir.

2.4.4.1 Borrow Area A-1

The extent of the Borrow Area A-1 is approximately 36 acres. The soils in Borrow Area A-1 are predominately silty sands, mostly resulting from weathered granite, with some cobbles and occasional boulders. The depth to bedrock varies from 5 to 45 feet with the deepest areas being in the southeast. It is estimated that approximately 400,000 cubic yards of suitable embankment material is available within Borrow Area A-1. Utilization of Borrow Area A-1 could impact approximately 36 acres of undisturbed land, most of which is within the area of inundation.

Under Alternative B, approximately 12.3 acres of wetlands within Borrow Area A-1 would be inundated. Under Alternative C, about 6.6 acres of wetlands within Borrow Area A-1 would be inundated. Neither Alternative B nor Alternative C would impact wetlands acreage in Borrow Area A-1 beyond the proposed inundation area.

2.4.4.2 Borrow Area A-2

Borrow Area A-2 is predominately rock outcrop with bedrock near the surface. As previously stated, this area could be used as a quarry for riprap material, if sufficient riprap is not available from Borrow Area A-1. If the area is used in the construction of the dams, it could disturb up to

approximately 3.0 acres of undisturbed land which contains no wetlands. A portion of Borrow Area A-2 would be inundated under Alternatives B and C.

2.4.4.3 Borrow Area B

Borrow Area B would only be used as a supplemental source of suitable embankment material if required. According to Chen (1982), there is approximately 90,000 to 100,000 cubic yards of silty sand, gravel, cobbles and occasional boulders which could be used as borrow material. If this area is used, it could disturb up to 18 acres of undisturbed land which contains no wetlands. As shown on Figure 2-5, Borrow Area B is not adjacent to the reservoir, and therefore, would not be inundated under either the proposed reservoir expansion (Alternative B) or the smaller reservoir expansion (Alternative C).

2.5 COMPARISON OF IMPACTS OF ALTERNATIVES ANALYZED IN DETAIL

The alternatives to the proposed Fish Creek Reservoir Expansion have been developed and evaluated based on the issues identified as part of the public scoping process. Table 2-1 presents a summary of the relative impacts of each alternative, including the No Action Alternative, to the resource area issues identified in the scoping process. A more detailed discussion of impacts is presented in Chapter 4.

2.6 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The Forest Service Preferred Alternative is Alternative B.

2.7 PROJECT ALTERNATIVES AVAILABLE TO THE APPLICANT

Several project alternatives are potentially available to the Applicant including:

- Water Conservation
- Infiltration Gallery Expansion
- Combination Alternative (Water Conservation, Infiltration Gallery Expansion, Fish Creek Reservoir Modernization)

The Applicant may or may not elect to expand the Fish Creek Reservoir, depending on the Forest Service final decision on the EIS and other relevant factors. Water conservation and infiltration gallery expansion were identified during the scoping process as alternatives to reservoir expansion. These alternatives, however, cannot be selected by the Forest Service because the Forest Service has no authority to require the Applicant to impose conservation practices on the residents of the City of Steamboat Springs or require the City or Mt. Werner to expend tax dollars for expansion of the infiltration galleries. However, selection of the No Action Alternative by the Forest Service would most likely cause the Applicant to consider these alternatives to provide for the future water needs of the area. The alternatives are discussed in the following sections because of public interest and comments from cooperating agencies, and in fulfilling the intent of NEPA and its disclosure requirements.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
DAM SAFETY/FLOOD HAZARD		
▸ Peak downstream flows in event of flood are 63,200 cfs	▸ Peak downstream flows in event of flood are 136,200 cfs	▸ Peak downstream flows in event of flood are 80,400 cfs
▸ No early warning system, affecting public safety	▸ Increased capability to detect and control problems with dam due to installation of early warning monitoring system	▸ Impacts same as Alternative B except for downstream flows in event of flood
▸ Annual dam inspections by the State would continue.	▸ Improved dam stability (static and dynamic) due to improved construction techniques and materials and control of dam seepage	
▸ Operation and control of reservoir outlet by manual adjustments would preclude emergency releases	▸ Remote operation of outlet gate; outlet design allows for operational flexibility and the ability to release larger volumes of water	
▸ Existing dam service road would continue to be utilized	▸ Dam access road would be improved, allowing easier access to the dam	
▸ Continued development in flood inundation area would contribute to the flood safety hazard	▸ Continued development in flood inundation area would contribute to the flood safety hazard	

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
WATER RESOURCES		
▸ No additional storage capacity would be provided to the public	▸ Storage capacity of the reservoir would be increased by 2,280 AF	▸ Storage capacity of the reservoir would be increased by 908 AF
▸ Erosion of Puppy Dog Lake Drainage and downstream sedimentation would continue	▸ Degradation of Puppy Dog Lake drainage would be corrected and sedimentation would be reduced	▸ Degradation of Puppy Dog Lake drainage would be corrected and sedimentation would be reduced
▸ Mt. Werner could not meet present or future water demands and would have to develop additional water supplies; City could not meet long-term water demands	▸ Could meet present and future water demands of the City and Mt. Werner	▸ Could meet present and some of future water demands; City and Mt. Werner would have to develop additional water supplies to meet future long-term demands
▸ No guarantee that alternative water supply would be of same water quality as the Fish Creek supply	▸ Could depend entirely on high quality water of Fish Creek Reservoir	▸ No guarantee that alternative water supply would be of same water quality as the Fish Creek supply
▸ No in-stream flow augmentation or maintenance of in-stream flows	▸ In-stream flow augmentation and maintenance of CWCB in-stream flow right in lower Fish Creek	▸ Possible short-term in-stream flow augmentation
▸ No long-term fisheries pool	▸ A fisheries pool would be maintained	▸ Possible short-term fisheries pool
▸ Water quality impacts associated with increased recreational usage of the reservoir (cumulative impact)	▸ Water quality impacts associated with increased recreational usage of the reservoir (cumulative impact)	▸ Water quality impacts associated with increased recreational usage of the reservoir (cumulative impact)

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
SOCIOECONOMICS		
▸ Lack of water resources could potentially limit growth in the future	▸ Water would not be a limiting resource to growth	▸ Lack of sufficient water resources could potentially limit growth in the future
▸ No early warning system to warn community of a dam failure and flood hazard	▸ Early warning system installed to alert community of dam failure and flood hazard	▸ Early warning system installed to alert community of dam failure and flood hazard
▸ More money available for other capital improvement projects	▸ Total cost of expansion would be $6,000,000 ($2,600 per AF of water)	▸ Total cost of expansion would be $4,200,000 ($4,600 per AF of water)
	▸ Construction costs and share of water would be split 75%/25% by Mt. Werner and City, respectively	▸ Construction costs and share of water to be negotiated by Mt. Werner and City
▸ Community satisfaction with water quality may decrease if an inferior water supply is utilized		▸ Community satisfaction with water quality may decrease if an inferior water supply is utilized
		▸ Additional money available for other capital improvement projects
▸ Expenditures to date of $1,000,000 (for analysis and design) would be lost		▸ Expenditures to date of $700,000 (for design) would be lost
WETLANDS		
▸ 0 acres of wetlands would be impacted	▸ 15.09 acres of wetlands would be impacted	▸ 8.80 acres of wetlands would be impacted
	▸ At least 22.6 acres of wetlands would be recreated	▸ At least 13.2 acres of wetland would be recreated
SOILS		
▸ 0 acres of soils would be impacted	▸ 60.6 acres of soils would be impacted	▸ 29.6 acres of soils would be impacted
VEGETATION		
▸ 0 acres of vegetation would be impacted	▸ 51.4 acres of vegetation would be lost (includes wetlands, upland meadows, mixed conifer and previously disturbed areas	29.5 acres of vegetation would be lost (includes wetlands, upland meadows, mixed conifer and previously disturbed areas

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
WILDLIFE/FISHERIES		
▸ Stream habitat in Puppy Dog Lake Channel would continue to degrade	▸ Stream habitat in Puppy Dog Lake Channel would be improved	▸ Stream habitat in Puppy Dog Lake Channel would be improved
▸ No long-term fisheries pool would be maintained	▸ Long-term fisheries pool would be maintained	▸ Short-term fisheries pool could be maintained
	▸ Expanded shoreline would inundate 51.4 acres of terrestrial and wetlands habitat which would be irreversibly lost	▸ Expanded shoreline would inundate 29.5 acres of terrestrial and wetlands habitat, which would be irreversibly lost
	▸ Short-term displacement of wildlife due to construction activities	▸ Short-term displacement of wildlife due to construction activities
	▸ High mountain lake habitat for fish is enlarged, but stream habitats would be reduced	▸ High mountain lake habitat for fish is enlarged, but stream habitats would be reduced
	▸ Indirect and minor impacts to endangered species of fish in Colorado River due to modifications of flow releases (timing and quantity) from Fish Creek Reservoir	▸ Indirect and minor impacts to endangered species of fish in Colorado River due to modifications of flow releases (timing and quantity) from Fish Creek Reservoir
	▸ Potential habitat loss may affect federal candidate species including the Boreal Toad	▸ Potential habitat loss may affect federal candidate species including the Boreal Toad
▸ Increased use of the area would result in more displacement of wildlife (cumulative impact)	▸ Increased use of the area would result in more displacement of wildlife (cumulative impact)	▸ Increased use of the area would result in more displacement of wildlife (cumulative impact)
▸ Fish Creek Reservoir would be restocked with fish	▸ Fish Creek Reservoir would be restocked with fish	▸ Fish Creek Reservoir would be restocked with fish

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
RECREATION		
	▸ Would displace summer visitors to other recreation resources for 2 years	▸ Impacts same as Alternative B
	▸ Use pressures on other recreation resources could increase due to displaced Fish Creek visitors during construction	
	▸ Granite Campground, parking lot, and Shoreline Trail would be inundated	
▸ Existing Granite Campground would remain in its present condition with no upgrade or improvement; presently not accessible to the disabled	▸ New, larger Granite Campground and parking lot would increase visitor capacity of developed facilities and thus accommodate more people and better disperse visitors throughout Buffalo Pass area; would be accessible to the disabled	
	▸ A larger Granite Campground would help to lessen impacts to fragile ecosystems along Buffalo Pass from visitors in the area by dispersing use	
▸ Cumulative impacts from increased tourism due to summer marketing and from proposed Buffalo Pass capital investment project	▸ Cumulative impacts from increased tourism due to summer marketing and from proposed Buffalo Pass capital investment project	

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
TRANSPORTATION		
▸ Existing service roads would continue to be used	▸ Service roads would be upgraded ▸ During mobilization and construction periods, average daily traffic along West Route would increase ▸ Probability of auto and/or bike accident would increase ▸ Increased probability of hazardous material or fuel spill during 2 seasons of construction ▸ Damage to roads and culverts would be likely and damage would need to be repaired by the permittee	▸ Impacts the same as Alternative B

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

TABLE 2-1
COMPARISON OF ENVIRONMENTAL IMPACTS

ALTERNATIVE A NO ACTION*	ALTERNATIVE B PROPOSED RESERVOIR EXPANSION	ALTERNATIVE C SMALLER RESERVOIR EXPANSION
VISUALS		
▸ Visual impacts would remain as they presently are; existing visual features (such as old borrow areas) would not be mitigated	▸ Larger dam structures visible ▸ Reservoir would not be completely drawn down; a long-term fisheries pool would be maintained ▸ Maintenance of CWCB in-stream flow in lower Fish Creek ▸ Visual mitigation would be incorporated into the design, and where possible, visual aspects of the project (including structures, parking areas, campground, roads, borrow areas, etc.) would be improved to meet the Visual Quality Objectives of the Forest Service ▸ Existing maintenance structure would be removed and replaced in a less visually impactive area ▸ Existing visual features (such as old borrow areas) would be mitigated	▸ Smaller dam structures than Alternative B visible ▸ Potential for complete reservoir drawdown in future; only short-term fisheries pool ▸ No maintenance of CWCB in-stream flow in lower Fish Creek ▸ Visual mitigation same as Alternative B
CULTURAL RESOURCES		
▸ No significant impacts	▸ No significant impacts	▸ No significant impacts

* The Forest Service could modify the existing Fish Creek Reservoir Special Use Permit and/or the existing operating plan to address certain environmental consequences of the No Action Alternative. At this point in time, mitigation requirements under the No Action Alternative have not been formally defined by the Forest Service. In the event that the No Action Alternative is selected by the Forest Supervisor, the nature and extent of potential mitigation would be further defined by the Forest Service.

2.7.1 Water Conservation

2.7.1.1 Introduction

Water conservation is briefly discussed in this section. A more comprehensive review of water conservation methods is presented in Appendix C, *Water Conservation.*

2.7.1.2 Background

In arid regions, such as the western United States, water has become an increasingly scarce natural resource. Due to rapid growth and development, demand for water has steadily risen and has surpassed available supplies in some areas. Water resource management has traditionally been applied to the construction of treatment facilities and the development of water supply projects such as dams and reservoirs. However, because water resources have become scarce in many regions of the country, it has become necessary for water resource managers to develop water conservation programs.

According to the United States Water Resources Council, water conservation is defined as activities designed to; 1) reduce the demand for water, 2) improve efficiency in use and reduce losses and waste of water, or 3) improve land management practices to conserve water (Maddaus, 1987). Through the installation of appropriate low flow water fixtures and by educating the public about techniques designed to reduce water use, water efficiency can be increased.

2.7.1.3 Methods of Water Conservation

There are a number of water conservation methods which would be available to the Applicant. A list of commonly used water conservation practices is presented in Table 2-2, Typical Long-Term Water Conservation Measures. A detailed discussion on various water conservation methods and the demand reductions that typically result from the implementation of these methods appears in Appendix C, *Water Conservation.* Table 2-3, Typical Demand Reductions, presents a summary list of the demand reductions that are reported in Appendix C. It is important to note that the ultimate results of implementing a formal water conservation program in the City and Mt. Werner would rely on many site-specific factors and would depend largely on the cooperation of the community, itself. The City and Mt. Werner are presently pursuing several water conservation measures, as discussed below.

2.7.1.4 Water Conservation Programs

Mt. Werner and the City have instituted water conservation plans and both districts are presently involved in various programs aimed at conserving water, as discussed below. The City of Steamboat Springs is in the process of implementing the following conservation measures:

> Metering/Rate Structuring - In order to delay the need to increase the capacity of treatment facilities and in accordance with Colorado's Water Metering Act of 1990, the installation of water meters in both the residential and commercial sectors of the City was completed in 1990, and meter based billing has been initiated. City Council has just recently adopted a rate structure to be applied to actual water usage throughout the City. Metering rates are included in Appendix H.

TABLE 2-2
TYPICAL LONG-TERM WATER CONSERVATION MEASURES

General	Public information In-school education Metering Pressure reduction Pricing Uniform commodity rates Inclining commodity rates Seasonal rates Leak detection and repair System rehabilitation Water Use Restrictions
Interior residential use	Low-flow shower heads Shower-flow restrictors Toilet–tank displacement bottles/dams Pipe insulation Faucet aerators Water-efficient appliances
Devices for new construction	Low-flush toilets and ultra-low-flow toilets Low-flow shower heads Pipe insulation Faucet aerators Water-efficient appliances
Power generation	*Recirculation of cooling water Reuse of treated wastewater *In-system treatment
Industrial use	*Recirculation of cooling water *Reuse of cooling and process water Reuse of treated waste water Efficient Landscape irrigation Low-Water-using fixtures *Process modification
Agricultural irrigation	Off-farm conveyance systems *Canal lining, canal realignment, canal consolidation *Phreatophyte control On-farm distribution and irrigation systems *Ditch lining or piping *Water-control structures *Land leveling or contouring Sprinkler irrigation Drip irrigation Subsurface irrigation *Tailwater irrigation Irrigation scheduling *Improved tillage practices Surface mulches Pressure regulator
Landscape irrigation	Efficient landscape design Low-water-use plant material Scheduled irrigation Efficient irrigation systems Tensiometers

*These conservation practices are not discussed in detail in this report.

TABLE 2-3
TYPICAL DEMAND REDUCTIONS

Conservation Practices	Typical Reductions
Inclining Block Rates	10% of Residential Water Use
Peak/Seasonal Demand Pricing	6-83% of Peak Demand 3-10% of Total Demand
Pressure Reducing Valves (PRVs)	10% of Total Supply
General Outdoor Conservation	40-54% of Outdoor Use
Ultra Low Flow Toilets	57-78% of "Toilet Demand"
Low Flow Showerheads	34-50% of "Shower Demand"
Faucet Aerators	Up to 48% of "Faucet Demand"
Retrofit Kits sent to homes (toilet tank bag, leak detector, dye tablets, shower flow restrictors, rain gauges)	Up to 6% of Indoor Use
Public Education	8% of Total Water Use

System Maintenance - The City has recently begun replacing all of its main water lines. The program, which began five years ago, involves the replacement of approximately 40 miles of water pipes over a 30-year period. It is estimated that the entire system will be replaced by the year 2020. Although the City has no formal leak detection program included with the maintenance being done, the replacement of the water lines will reduce leakage, and the installation of meters will increase the City's ability to determine the amount of water being lost to leaks.

Irrigation Restrictions - Lawn watering is restricted between the hours of 10:00 AM and 5:00 PM, but compliance is strictly voluntary as no enforcement of this regulation exists. The *Steamboat Today* publishes irrigation requirements according to local precipitation patterns, and prescribes different homes to water on different days (according to address). Again, compliance with these guidelines is voluntary.

Raw Water Use - Raw, untreated water is currently taken from the Yampa River and used for snowmaking at the Howelsen Hill Ski Area. The use of raw water, although not necessarily a conservation technique, helps to reduce the demand for potable water and thus results in treatment cost savings.

Xeriscape Grant - The City of Steamboat Springs has received a $19,000 grant from the Colorado State Office of Water Conservation (COWC) in order to partially fund the design and construction of a high-altitude, xeriscape demonstration at Howelsen Hill Park. Intended to introduce the community to the idea of xeriscaping, the demonstration will compare the water use, maintenance, and visual appearance of a 'xeriscape' to that of a 'normal' landscape. In addition, a guide to water efficient landscapes in Colorado mountain communities will be developed. The demonstration is planned for the summer of 1993.

Plumbing Retrofit Grant - The City of Steamboat Springs has been selected as the test site for a study on the cost effectiveness of retrofitting tourist-oriented lodging complexes. The study will be conducted by the Northwest Colorado Council of Governments and will be funded by a $20,425 grant issued by the COWC. The study will analyze the water use patterns of tourists and will compare the water demand in retrofitted condominiums to demand in non-retrofitted condominiums. From the data obtained, the cost effectiveness of retrofitting large condominiums, including the potential savings that can result, will be determined. The findings of this study will be made available to all resort communities.

Pressure Reduction Valves - The City requires the use of pressure reducing valves (PRVs) in order to ensure that the water pressure in its system does not exceed 60 pounds per square inch (psi). PRVs are installed, not only on main lines, but at each point of use in the system. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system. Water pressure has direct effects on the flow rates of common plumbing fixtures and should thus be maintained at 50-60 psi for maximum efficiency.

Mt. Werner is implementing the following conservation measures:

Metering/Rate Structuring - The installation of water meters in the residential and commercial sectors of the district was completed in 1991, and meter-based billing began in January 1993. Consumers are charged a base rate that includes a service charge and receive 10 cubic meters (2,640 gallons) of water per month with the base rate. Water usage above this monthly allotment is billed on a per cubic meter basis. This rate structure is used for both residential and commercial consumers. Metering rates are included in Appendix H.

Lawn Irrigation - Like the City, lawn watering in Mt. Werner is restricted between 10:00 AM and 5:00 PM and information on efficient irrigation is provided in the *Steamboat Today.*

New Construction Ordinance - According to Mt. Werner, its Rules and Regulations (April 1991) require all new buildings constructed in the Mt. Werner Water District to have water-efficient plumbing fixtures. These include low flow toilets, low flow showerheads, and faucet aerators.

Pressure Reduction Valves - Mt. Werner also requires the use of pressure reducing valves (PRVs) in order to ensure that the water pressure in its system does not exceed 60 psi . PRVs are installed, not only on main lines, but at each point of use in the system. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system.

Raw Water Use - Like the City, Mt. Werner promotes the use of raw water, in some circumstances, to reduce demand for treated water. The Steamboat Ski Area uses water form the Yampa River to make snow and the Sheraton Golf Course uses water from Fish Creek for irrigation.

Plumbing Retrofit Grant - The Mt. Werner Water and Sanitation District is assisting the City of Steamboat Springs with the study on the cost effectiveness of retrofitting condominiums with low flow devices.

2.7.1.5 Impacts of Conservation

Under the conservation alternative, water demands could be reduced by approximately 10 to 20 percent. This represents a water savings of approximately 260 to 520 AF/year today; 500 to 1,000 AF/year in the year 2013; and 930 to 1,860 in the year 2033. The short-term consequences of this reduction in water demand include increased streamflows and increased water levels in the reservoir. In the long-term, however, the consequences would be the same as those described under the No Action Alternative.

Cumulative impacts associated with the reduction in water demand would include the cost savings associated with the decrease in water and wastewater treatment volumes. Water and wastewater treatment operation and maintenance costs would be reduced and costly treatment plant expansions

could be avoided. Additionally, infrastructure capital and operation costs associated with the distribution of water and collection of wastewater could be reduced.

With a metered billing rate, however, conservation could also result in decreased water and wastewater utility revenues. Furthermore, it could take several years before the effects of conservation are realized and facility expansion could still be required.

Additionally, the utilization of water conservation techniques, such as xeriscaping, could alter the visual nature of the landscape to a more native appearing landscape.

2.7.2 Infiltration Gallery Expansion

2.7.2.1 General Description

Another alternative available to the City and Mt. Werner is the Infiltration Gallery Expansion. The City and Mt. Werner have both constructed infiltration galleries (also known as well fields) to augment the water supplied from the Fish Creek basin. The main purpose of the infiltration galleries is to provide a point of redundancy to the primary Fish Creek water supply. The galleries are also utilized as a supplemental supply during peak water demands.

There have been water quality concerns associated with the use of the infiltration galleries. The alluvial groundwater of the Yampa River Basin has a high mineral content and is higher in alkalinity, hardness, and dissolved solids than the Fish Creek source. Additionally, the alluvial groundwater has relatively high concentrations of iron and manganese and has exceeded secondary drinking water standards. While iron and manganese are not suspected to cause any health problems, they are known to create aesthetic impacts such as objectionable taste and odor; staining of fixtures; and pool discoloration.

Under the Infiltration Gallery Expansion Alternative, the City and Mt. Werner would expand the galleries and pump water from this system into the service area. A second water filtration plant (in addition to the existing Fish Creek Filtration Plant) would be constructed at the infiltration gallery site and the City and Mt. Werner would have to operate two separately located facilities.

2.7.2.2 Impacts of the Infiltration Gallery Expansion

Environmental consequences associated with the expansion of the infiltration galleries include the following:

- Inferior water quality provided to a portion of the community
- Loss of a redundant (back-up) water source
- Impact to approximately 3 acres of wetlands
- Impact to high value riparian area and disturbance to heron rookery in the Yampa Valley
- A long-term fisheries pool at the existing reservoir may not be possible
- Long-term in-stream flow augmentation in lower Fish Creek may not be possible
- The need to construct, operate, and maintain a second water filtration plant

- The need to construct, operate and maintain additional water distribution facilities
- Greater operation and maintenance (O&M) costs (resulting in higher water rates) associated with additional treatment and pumping
- Higher power requirements for pumping (resulting in increased utilization of non-renewable energy resources and increased air pollution)
- Modernization and upgrade of the Fish Creek Reservoir would not occur

The Forest Service, City, and Mt. Werner have eliminated the Infiltration Gallery Expansion from further consideration at this point in time for several reasons including poor water quality, loss of back-up water supply, the need to construct additional water treatment and distribution facilities, and the continued pumping costs associated with utilization of the infiltration galleries. Concerns associated with the infiltration galleries are detailed in Section 3.3.4.2 of this EIS and in the City's *Infiltration Gallery Analysis* included as Appendix D.

2.7.3 Combination Alternative

2.7.3.1 General

Under a Forest Service No Action decision, the City and Mt. Werner would be required to develop alternative water supply sources to meet Mt. Werner's immediate needs and the City's long-term needs. The following Combination Alternative has been developed by the City and Mt. Werner, at the request of EPA, and includes the following three major components:

- Water Conservation
- Infiltration Gallery Expansion
- Fish Creek Reservoir Modernization

2.7.3.2 Conservation

Water conservation has been addressed in Section 2.7.1. It is the intent of both the City and Mt. Werner to implement the conservation practices outlined, regardless of the Forest Service decision. Water conservation not only represents a "savings" in terms of water demand, but it also results in water and wastewater treatment capital and O&M (operation and maintenance) cost savings.

The City and Mt. Werner are pursuing water conservation with the anticipation of reducing water demands by 10 to 20 percent over the next ten years. Assuming that conservation practices reduce water demands by 10 percent, a water savings of approximately 260 AF/year could be realized in 1993, 500 AF/year in 2013, and 930 AF/year in 2033. If water demands are reduced by 20 percent through conservation, the savings realized would equal 520 AF in 1993, 1,000 AF in 2013, and 1,860 AF in 2033.

2.7.3.3 Infiltration Gallery Expansion

Infiltration gallery expansion has been addressed in Section 2.7.2. As stated, it is the preference of the City and Mt. Werner to retain the infiltration galleries as a point of redundancy to the water system, and not develop them further as a primary water supply. In the event, however, that additional storage capacity would not be permitted, the City and Mt. Werner would have to expand and upgrade the existing galleries. Under this scenario, Mt. Werner would expand their portion of the infiltration galleries by approximately 3.0 MGD. Three 1.0 MGD expansions would be

constructed in 2010, 2020, and 2030. Land is presently available for the 2010 expansion, but additional area would have to be located and purchased for the final two expansions. Infiltration gallery expansion costs are estimated at 2.5 million dollars. A second water filtration plant (in addition to the existing Fish Creek Filtration Plant) would be constructed at the infiltration gallery site. This 5.0 MGD facility would be constructed in several phases with the first 1.0 MGD phase constructed immediately at a cost of one million dollars.

Under this scenario, the City and Mt. Werner would have to operate two facilities, rather than one. Operation costs associated with this scenario would include additional personnel, additional chemical feed (due to poorer water quality), and additional pumping (since all of the water from this facility would have to be pumped into the system, where virtually all of the water from Fish Creek is fed through gravity). System maintenance costs would also be higher since pumps would have to be periodically maintained and replaced. O&M costs are estimated at $1.00 per 1,000 gallons, whereas, the Fish Creek Filtration Plant O&M costs are presently about $0.30/1000 gallons. This represents an increased O&M cost of approximately $700 per day or $255,000 per year assuming that the infiltration galleries provide 1.0 MGD of treated water to the service area.

2.7.3.4 Fish Creek Reservoir Modernization

Under the Combination Alternative, a number of improvements at the existing reservoir would be implemented, including:

- Addition of a larger outlet structure
- Repair of the erosional damage in the Puppy Dog Lake channel
- Installation of an underground electric power supply
- Installation of a remote operational control and early warning system
- Repair and upgrade of existing roads
- Visual mitigation at the site (including revegetation and maintenance shed repair)

Costs for these improvements are estimated at 1.32 million dollars.

Under the Combination Alternative, Mt. Werner would no longer have an interest in the existing reservoir and would, therefore, decline to participate in the reservoir improvements identified above. While the City would desire to make the identified improvements, it would likely not be able to devote the financial resources to add remote operation, dam warning, and a high capacity outlet given other more urgent needs of the City's utility. These include ongoing replacement of aging and leaking mains and over one million dollars in necessary improvements at the wastewater treatment facility to meet recent EPA sludge regulations. Since the City has not budgeted for improvements at the existing reservoir, financing for the Combination Alternative has yet to be determined.

2.7.3.5 Present Worth Analysis

A present worth analysis of the Combination Alternative was conducted using a 4% inflation rate, an 8% discount rate, and a forty-year period. Order of magnitude costs were utilized in the analysis. The following capital costs were included in the analysis:

- 1993 - $1,000,000 - New 1.0 MGD filtration plant at infiltration galleries
  $1,320,000 - Fish Creek Reservoir upgrades

- 2010 - $ 500,000 - 1.0 MGD infiltration gallery expansion

- 2020 - $1,000,000 - 1.0 MGD infiltration gallery expansion/land/piping
- 2030 - $1,000,000 - 1.0 MGD infiltration gallery expansion/land/piping

O&M costs (above the Fish Creek Filtration Plant costs) were factored into the analysis. The cost difference of $.70/1,000 gallons was applied to the projected flow rate through the infiltration gallery filtration plant. Average daily flow rates through this plant were estimated to range from .009 mgd in 1993 to 1.4 mgd in 2033.

Costs common to the Proposed Action (ie. additional filtration plant expansion costs) and sunk costs or money already spent (approximately 1 million dollars) were not included in the analysis.

The present worth cost of the Proposed Action was also estimated and included the following capital costs:

- 1993 - $5,000,000 - Fish Creek Reservoir Expansion
- 2003 - $ 750,000 - 1.0 MGD Fish Creek Filtration Plant Expansion

The present worth cost of the Combination Alternative was calculated to be $5.05 million and that of the Proposed Action was estimated at $5.51 million. The present worth of the two alternatives are very close, given the accuracy of the analysis.

2.7.3.6 Environmental Consequences of the Combination Alternative

Environmental consequences of the Combination Alternative include:

- Inferior water quality provided to a portion of the community
- Loss of a redundant (back-up) water source
- Impact to approximately 3 acres of wetlands due to construction of infiltration galleries
- Impact to high value riparian area and disturbance to heron rookery in the Yampa Valley
- A long-term fisheries pool at the existing reservoir may not be possible
- Long-term in-stream flow augmentation in lower Fish Creek may not be possible
- The need to construct, operate, and maintain a second water filtration plant
- The need to construct, operate, and maintain additional water distribution facilities
- Greater O&M costs (resulting in higher water rates) associated with additional treatment and pumping
- Higher power requirements for pumping (resulting in increased utilization of non-renewable energy resources and increased air pollution)

Table 2-4 compares the environmental consequences of the Proposed Action to those of the Combination Alternative.

TABLE 2-4
COMPARISON OF MAJOR IMPACTS OF COMBINATION ALTERNATIVE WITH PROPOSED ACTION

COMBINATION ALTERNATIVE	PROPOSED ACTION
Present Worth Cost of $5.05 million	Present Worth Cost of $5.51 million
Impacts to ~3 acres of wetlands	Impacts to ~15 acres of wetlands
Impacts to high value riparian area and disturbance to heron rookery in Yampa Valley	Impacts area already previously impacted by reservoir construction
Loss of redundant (back-up) water source	Preservation of redundant (back-up) water source
A long-term fisheries pool at existing reservoir may not be possible	Provision for 1,030 AF fisheries pool at existing reservoir
Long-term in-stream flow augmentation in lower Fish Creek may not be possible	Provision for 200 AF of in-stream flow augmentation in lower Fish Creek
The need to construct, operate, and maintain a second water filtration plant	Use of existing water filtration plant
Greater O&M costs for water treatment and distribution ($1.00/1,000 gal)	Lower O&M costs for water treatment and distribution ($0.30/1,000 gal)
Approximately 50% increase in typical monthly water bill to cover increased O&M costs	No increase in monthly water bill necessary to cover O&M costs
Inferior water quality provided to a portion of the community	High quality Fish Creek water provided to entire community
The need to construct, operate, and maintain additional water distribution facilities	Use of existing water distribution facilities
Higher power requirements for pumping (resulting in increased utilization of non-renewable energy resources and increased air pollution)	Lower power requirements (system almost entirely gravity fed)
Financing not in place; City would have to assume sole cost of retrofit to reservoir	Financing in place; City and Mt. Werner to share all costs on a 25%/75% basis.

CHAPTER 3

AFFECTED ENVIRONMENT



CHAPTER 3 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter identifies and describes the existing environmental conditions and resources which may be affected by the proposed action or alternatives. Preparation of the resource descriptions has been guided by applicable NEPA provisions presented in 40CFR Part 1502.15, which direct that the environmental document:

> *"... succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration..."*

Information presented in this chapter is taken from the baseline technical reports which contain detailed technical analyses and serve as back-up documentation to this EIS. The following resource areas are presented in the baseline technical reports and are summarized in this chapter:

- Dam Safety/Flood Hazard
- Water Resources (Water Rights, Quality, Demand, etc.)
- Socioeconomics
- Wetlands
- Vegetation
- Wildlife
- Recreation
- Transportation
- Visual Resources
- Cultural Resources

The reader wanting further detail than that presented in this chapter for these resource areas is referred to the baseline technical reports.

3.2 DAM SAFETY/FLOOD HAZARD

3.2.1 Introduction

A survey of the current conditions of the existing dam, dam operations, safety features, and flood hazard conditions at Fish Creek Reservoir, as well as a study of the geology, seismicity of the project area, were performed. The results of this survey appear in the *Dam Safety/Flood Hazard Baseline Technical Report for the Fish Creek Reservoir EIS* (ACZ, 1992a). Included in the following section is a discussion of existing dam structures, and of potential flood hazards associated with the current conditions at Fish Creek Reservoir. Geologic conditions associated with flood hazards which were identified in the aforementioned report are also discussed.

3.2.2 Existing Dam and Ancillary Structures

3.2.2.1 Current Conditions

The existing Fish Creek Reservoir is formed by two earthfill embankments, composed of a main dam and saddle dam as shown on Figure 3-1, Existing Fish Creek Reservoir. The main dam is a homogeneous, earthfill structure with chimney and blanket drains (WCC, 1991a). The maximum

height of the main dam is 55 feet, with a centerline length of 650 feet and a crest width of approximately 25 feet. The downstream and upstream slopes are 2:1 and 3:1, respectively (horizontal to vertical). The current outlet works are composed of a 24-inch diameter welded steel pipe, with an upstream control gate.

The saddle dam, located approximately 2,200 feet northeast of the main dam, is a zoned, earthfill embankment with a central core, blanket drainage zone, and upstream and downstream shells. This structure has a maximum height of approximately 16 feet and a crest length of 400 feet. The downstream and upstream slopes are 2.5:1 and 2.75:1, respectively.

3.2.2.2 Construction History

The original Fish Creek embankment was constructed in 1954-1955, as a modified homogeneous dam with the spillway located where the saddle dam is presently situated. The majority of the fill consisted of silty sand and gravel with a low percentage of cobbles. It is assumed this material was derived from the glacial sediments which are prevalent throughout the project area. The downstream toe of the embankment consisted of a relatively thick blanket drain connected to a vertical chimney drain.

The main dam was raised four feet in the late 1950's. However, detailed records of how this enlargement was completed are unavailable.

In 1973, the main dam was enlarged by placing random fill on the downstream portion of the original embankment. According to Chen (1982), the random fill consisted of slightly to very silty sand and gravel with a small to medium amount of cobbles. The drainage blanket was designed to extend beneath the toe of the enlarged section (Chen, 1982). However, field investigations conducted by Chen (1982), found no evidence the drainage was completed during construction. The outlet pipe, however, was extended downstream during 1973 construction and enlargement.

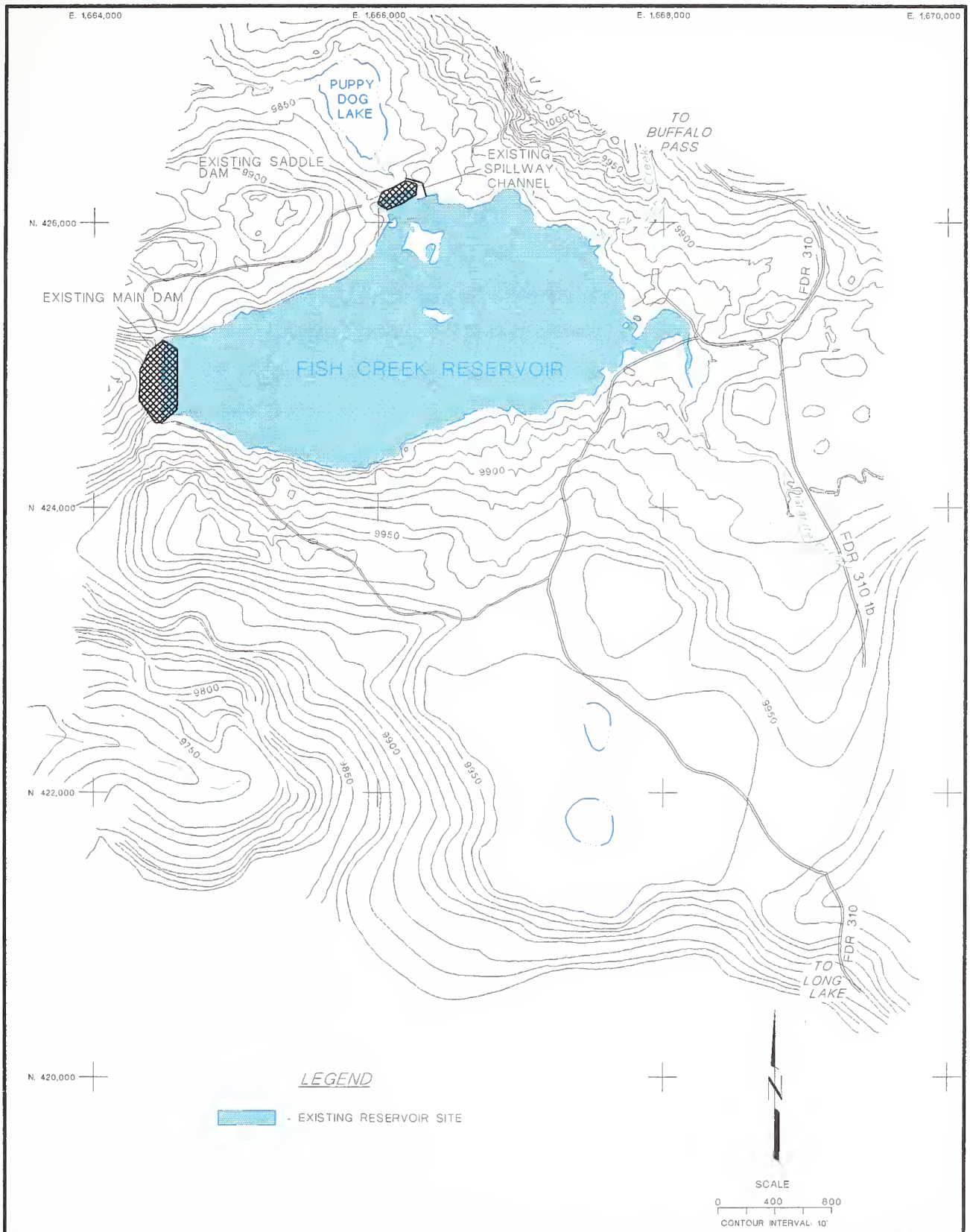
The saddle dam was also constructed in 1973, during the enlargement of the main dam and as a means to block the original spillway and provide greater storage capacity. A toe drain was not constructed as part of the saddle dam.

3.2.3 Dam Operations

Water levels are maintained and controlled in the reservoir by a 24-inch diameter welded steel outlet pipe. A gate at the inlet is controlled with a steel stem along the upstream face connected to a mechanical operator at the crest of the dam. The outlet structure intake gate does not seal well and prevents the complete shutoff of flow through the outlet (WCC, 1992a).

The existing spillway is an open-cut structure in bedrock located at the right abutment of the saddle dam (see Figure 3-1). The spillway discharges water into a small natural lake, Puppy Dog Lake, which flows into an intermittent drainage that joins Fish Creek, downstream of the main dam.

Currently, Fish Creek Reservoir has no remotely operated or automated systems to control water discharge.



Project No.: 828-1500	*Design By:* T. LEIDICH	*Scale:* SEE SCALE BAR	**FISH CREEK RESERVOIR EIS**
File: FC3EXIST.DWG	*Drawn By:* T. CLARK	*Date:* January, 1993	***EXISTING FISH CREEK RESERVOIR MAIN DAM & SADDLE DAM***
FIGURE 3-1			

3.2.4 Safety Features

In the unlikely event that either the main or saddle dam failed, it is estimated that floodwaters believed to be worse than the 500-year flood event, would reach Steamboat Springs in less than 30 minutes (CSM EPICS, 1990). Lives and property would be at risk. Currently, the Fish Creek dams contain no early warning system to alert the public to a flood hazard.

As part of the Colorado Dam Safety Program, the State has prepared a *Dam Safety Manual* (January 1988), that presents guidance and establishes compliance requirements for dam owners to maintain safe structures, avoid costly repairs, and prolong the life of the dam. The *Dam Safety Manual* classifies structures on the basis of hazards to human life. Accordingly, the Fish Creek Dam and saddle dams are designated as "Class A, High Hazard" dams since failure would cause extensive property damage and would possibly cause the loss of life (CSM EPICS, 1990). Based on the high hazard classification, the Colorado *Dam Safety Manual* recommends the following inspection/operation program:

- Daily - Surveillance by the owner or caretaker
- Weekly - Monitoring of seepage
- Monthly - Thorough visual inspections. Gathering, immediately plotting and interpreting observation well and piezometer data
- Annually - reading horizontal and vertical control monuments (more frequently if necessary)
- Test operation of outlet and spillway mechanical components
- Routine maintenance as required

Since their construction, the Fish Creek dams have received periodic inspections by personnel from the State Engineer's office and the City. Daily and weekly inspections are not feasible during winter and spring months. However, flood impacts are also highly reduced during this period, due to low flow conditions in Fish Creek. In 1980, an inspection was performed by Charles T. Main, Inc. under the National Dam Safety Program. Recently, the State of Colorado, Division of Water Resources - Dam Safety Branch has completed dam safety inspections on the Fish Creek embankment. According to inspection records, the most recent inspection occurred on October 7, 1992, with previous inspections approximately 14 months prior to this date. During the October 1992 inspection, the Fish Creek Dam and outlet structure were reported in satisfactory condition with minor seepage recorded along the left abutment and evidence of minor slump/slide features on the downstream slope.

As part of the Emergency Preparedness Program, outlined by the Colorado Office of Dam Safety, the City has completed an *Emergency Preparedness Plan* (July 1992). This plan includes details on the dam operation and storage capacities, a list of persons downstream first affected by floodwaters, and an emergency plan which identifies responsible public officials in the case of an emergency. A copy of this plan appears in Appendix E.

3.2.5 Geologic Conditions

3.2.5.1 General

The project area lies in northwest Colorado, near the Continental Divide. Situated on the west flank of the Park Range, the Fish Creek Reservoir is underlain by Precambrian granitic and metamorphic rocks which have been upthrown along north-south and northeast-southwest trending normal faults. The reservoir is located immediately northwest of the gently sloping crest of the Continental Divide.

The general landform associated with the project area is characterized as stable, rugged mountain terrain with numerous rock outcrops. West and northwest of the reservoir site, the terrain steepens significantly, due to deep erosion caused by Fish Creek.

The regional geology of the project area includes granitic, metamorphic and unconsolidated surficial deposits and rock of Quaternary age. Granitic rock outcrops are mapped (Tweto, 1979) in and near the reservoir site and include granites, quartz monzonites or granodiorites, approximately 1,700 million years in age. Metamorphic rock outcrops have been mapped (Chen, 1982) in the immediate vicinity of the reservoir area and designated borrow sources. Metamorphic rock typically contains minor hornblende, gneiss, calc-silicate rock, quartzite and marble. Much of the project area is covered by unconsolidated surficial deposits and rock of Quaternary age believed to be associated with Pinedale and Bull Lake Glaciation episodes.

The surficial geology of the reservoir area has been mapped by several authors (Chen, 1982; WCC, 1991; Madole, 1991a).

3.2.5.2 Bedrock Geology

Bedrock outcrops composed of metamorphic and locally igneous intrusive rock exist within the footprint of the reservoir and throughout the general vicinity of the project site. These rocks are generally considered quite strong and moderately fractured. Weathering of the rock surface varies from fresh to moderate. The more resistant igneous rocks are generally strong and only slightly weathered while the metamorphic rock (gneiss and schist) exhibit greater degrees of weathering.

Chen (1982) has mapped three principal joint sets which are present along the 1) left abutment of the main dam, 2) right abutment of the main dam, and 3) along the saddle dam. Joints generally represent fractures in the rock mass which are vertical or transverse to the bedding direction and along which no appreciable movement has occurred.

Several northeast-southwest trending faults have been mapped in the immediate vicinity of the project (Tweto, 1979). The seismic impact associated with these faults is discussed in detail in Section 3.2.6.

3.2.5.3 Surficial Geology

The *Surficial Geologic Map of the Steamboat Springs Area* (Madole, 1991a) has identified two principal surficial material types. The main dam area and immediately west of the centerline of the main dam has been mapped as residuum on Precambrian crystalline rock. This material is composed of sand, silt, some clay, and angular to subrounded clasts that are chiefly schist, gneiss, amphibolite and granitic rock. East of the main dam embankment and composing the reservoir, the area has been mapped as glacial deposits composed of boulders, cobbles, and pebbles in a sandy matrix. This unit

is believed to be 1-5 meters thick in most places, with a maximum thickness of approximately 30 meters.

According to Chen (1982), the soil deposits in the vicinity of the project site are predominantly of glacial origin. Most of the soils are glacial till (Pinedale and Bull Lake Glaciation episodes) and are composed of poorly sorted gravel, cobbles and boulders in a sandy silt matrix. A thin veneer of alluvial soils are present along the floodplain of Granite Creek, the Middle Fork of Fish Creek, and several unnamed creeks flowing into the reservoir area. The alluvial soils are generally well sorted, and the matrix has a lower percentage of fines (fine sand, silt and clay) than the glacial deposits. In addition, Chen (1982) encountered alluvial soils in pits excavated downstream of the saddle dam structure near the northern edge of Puppy Dog Lake, in the drainage below the proposed spillway and upslope of an old borrow area on the southeast side of the reservoir.

3.2.6 Geologic Hazards

Geologic hazards associated with the Fish Creek Dam may include seismic hazards, geotechnical/foundation failure impacts, and mass movement. Brief descriptions of each impact are presented below.

3.2.6.1 Seismic Hazards

Seismic hazards impacting the project site may be manifested as surface faulting and strong ground-shaking, related to earthquake activity in the surrounding region. Associated ground disturbance such as differential settlements and liquefaction may occur, depending on the type of soil conditions prevalent at the site and the magnitude of the seismic event. The probability of having an earthquake in some regions is greater than others and is generally a function of the seismic activity in a particular region and their intensity. Ground shaking associated with a seismic event near a particular embankment may impact foundation conditions. For example, foundations consisting of low relative density sands and silts or uniform fine-grained, cohesionless materials, may result in the development of high pore pressures resulting in liquefaction conditions. Similarly, ground vibrations caused by earthquakes often lead to compaction of cohesionless soil deposits and associated settlement of the ground surface.

In the Central Rocky Mountains of northern Colorado, seismicity appears to be primarily associated with the faulted Laramide age mountain uplifts (Algermissen et al, 1982). Fish Creek is situated in the Northern Rio Grande Rift subprovince of the Central Rocky Mountain region. This subprovince includes Neogene (approximately the past 25 million years) age faults, historical earthquakes and major structural and physiographic regions. Active fault activity is defined by the age of material displaced by fault movement. According the Colorado Geologic Survey (Kirkham and Rogers, 1981) potentially active faults are defined as faults that have experienced movement during the Neogene period. This categorization is not intended to imply that all potentially active faults are hazardous, but rather that these faults should be considered in the design of a critical structure. Kirkham and Rogers' (1981) potentially active fault classification exceeds other acceptable definitions of seismic capability.

Other regulating agencies, including the U.S. Nuclear Regulatory Commission (NRC), have identified active faults as those faults that have displaced Holocene (10,000-12,000 years) age material. Typically, active fault activity is in the form of well developed, non-degraded topographic scarps, that suggest geologically recent (early Pleistocene to Holocene) development, or in the form of stratigraphic displacement of Quaternary sediments that demonstrate relatively young movement.

For the Fish Creek Dam evaluation, active faulting is assumed to be associated with seismic events that have displaced Holocene or younger age material.

The Colorado Geological Survey has mapped the Steamboat Springs Fault and an associated group of east-dipping faults as the nearest potentially active faults. The Steamboat Springs Fault is thought to have about 300 meters of vertical movement since deposition of the Miocene-Pliocene Browns Park Formation. There has been no mapped or inferred data which suggests Quaternary or Holocene movement has occurred on the Steamboat Springs Fault. Based on magnitude versus fault length relationships presented by Slemmons (1977), and assuming the Steamboat Springs fault experienced movement, a maximum credible earthquake (MCE) with a magnitude of 6.6 could be generated. This magnitude earthquake corresponds with the Colorado Geological Survey estimate of maximum credible earthquakes for the Northern Rio Grande seismotectonic subprovince.

A review of recent high altitude infrared aerial photography (1" = 2,000') identifies several prominent lineaments which are situated in the immediate vicinity or adjacent to the project boundaries. Each photograph was analyzed for the presence of linear features (lineaments) which may represent recent fault activity. In general, lineaments were manifested as linear drainages, rock contacts, landforms, vegetation alignments, and optical density (tone) changes. In addition to a lineament analysis, each image was examined for evidence of: 1) folded structures, the axes of which were determined by observation of strike and dip; and 2) major rock type, which is differentiated on the basis of color, tone, drainage density, drainage pattern, geomorphic expression and land use.

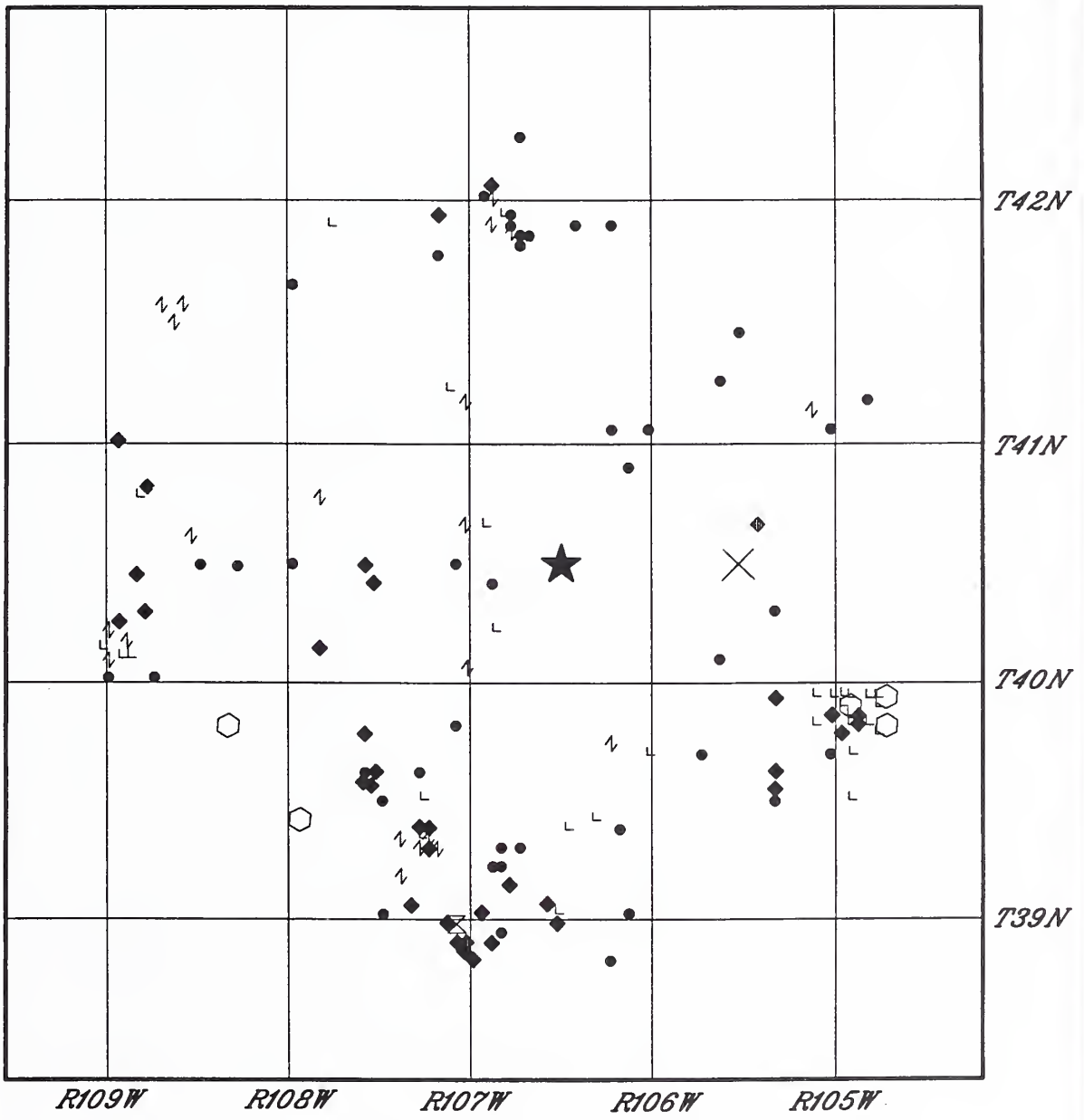
The bedrock structural geology, as defined in Section 3.2.5.2 includes three predominant conjugate joint sets (Chen, 1982). Based on the orientation of these structural features, they may represent lineaments which were detected during the lineament analysis for the project. The primary orientation of the lineaments detected during the analysis trend northeast-southwest. This orientation generally coincides with one of the three primary joint sets mapped previously by Chen (1982), at the site.

The nearest lineament to the reservoir area trends northeast-southwest and is located approximately 1.3 miles from the project site. This lineament is shown on the Geologic Map of Colorado (Tweto, 1979), and was identified during the photogeologic lineament analysis. Based on a review of all existing information, including infrared aerial photography, there is no evidence which indicates recent (Holocene) activity along this lineament.

Based on a review of the U.S. Geological Survey (USGS), National Earthquake Information Center earthquake data, earthquakes recorded from 1871 to 1991 at a radius of 200 km (124 miles) from Steamboat Springs, Colorado were plotted. A plot of the earthquake epicenters is presented on Figure 3-2, Earthquake Epicenters. The selection of a 200 km radius for earthquake data is subjective. However, earthquake attenuation curves, generated for both bedrock and soil conditions (Seed and Idriss, 1982), indicate significant attenuation of earthquake energy from the zone of energy release. Beyond a 200 km radius from the site for any given earthquake event the peak horizontal bedrock acceleration is substantially dampened.

Since 1871, the Steamboat Springs area has experienced over 378 earthquakes within a 200 km radius. Earthquakes occurring outside of the 200 km radius are not expected to have any damaging effects on the reservoir. The majority of the earthquakes occurring within the 200 km radius zone have been small, ranging in body wave magnitudes from 2 to 5. There have been 57 seismic events registering magnitudes greater than 3.5 (see Table 3-1, Earthquake Summary, 1871 to 1991).

U.S. Geological Survey, National Earthquake Information Center
Data taken from the Earthquake Data Base System .



BODY WAVE MAGNITUDES

? 1 2 3 4 5 6

★ — PROJECT LOCATION

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File: FC3EPIC.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-2

FISH CREEK RESERVOIR EIS

EARTHQUAKE EPICENTERS 1871 - 1991

TABLE 3-1 EARTHQUAKE SUMMARY 1871 - 1991	
RANGE OF MAGNITUDES	NUMBER OF EVENTS
1-2	12
2-3	183
3-4	45
4-5	44
5-6	5
>6	1
Include body-wave magnitude (mb) or average National Earthquake Information Service (NEIS) magnitude as well as contributed magnitudes. In the event both mb and contributing magnitude values were recorded the higher value was used.	

The most commonly used measurement for describing the relative size of earthquakes is magnitude. A number of different magnitude scales have been developed, each based on the measurement of a specific wave or phase that has propagated away from the earthquake source. As a result, several different magnitude values may be assigned to the same earthquake. Each different magnitude is recorded on standard seismographs which record the peak amplitude of an earthquake event.

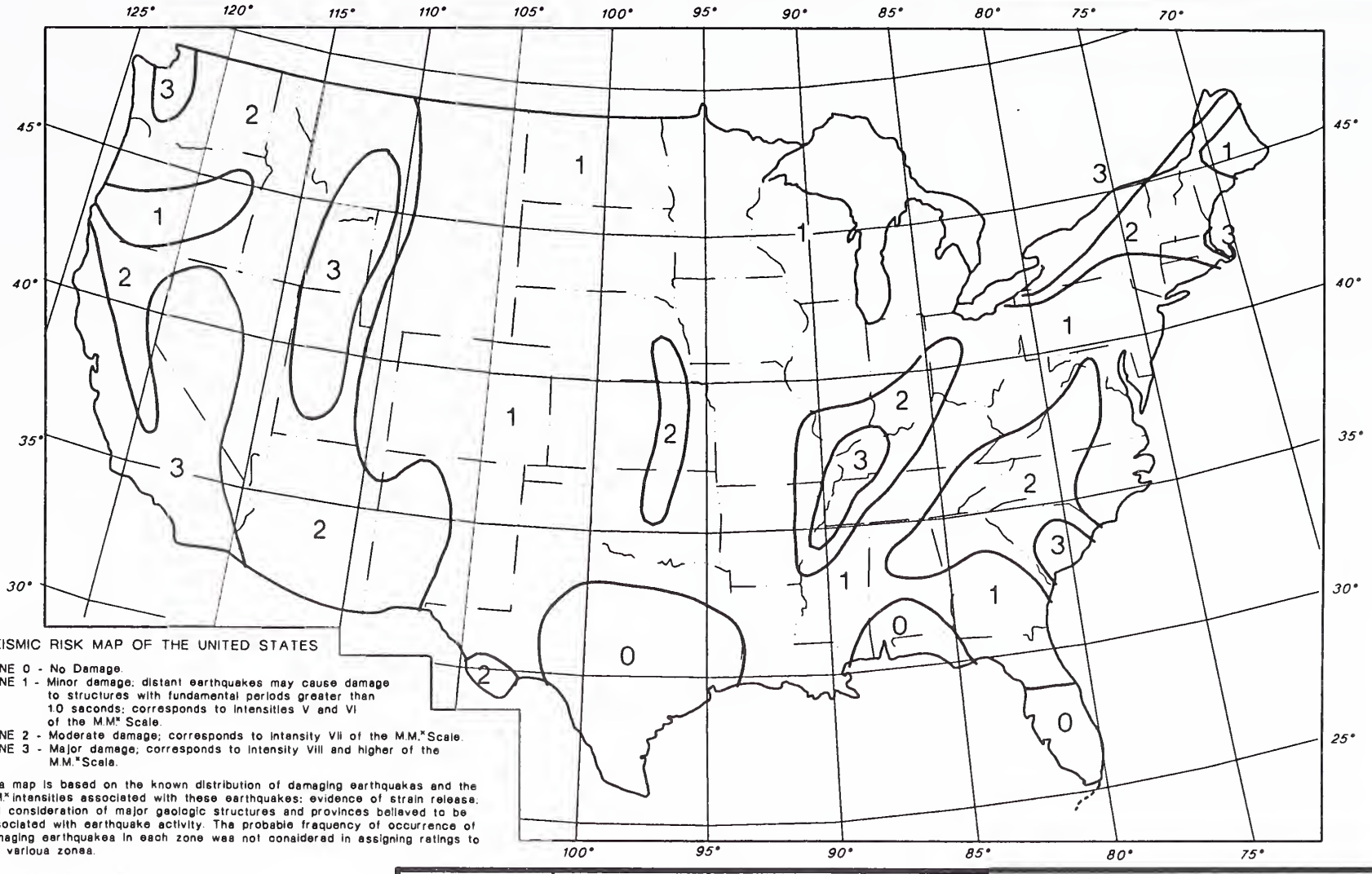
Seismic data listed in Table 3-1 and on Figure 3-2 is based on body-wave magnitudes. Body wave magnitudes are computed from the amplitude and period of seismic waves (ie. waves that travel through the interior of the earth). This scale is commonly used in seismic hazard studies in the eastern and central United States because there exists a data set of body-wave magnitudes for stable continental interiors (Coppersmith, 1987).

The closest measured earthquake event to the Fish Creek project site was recorded approximately 26 kilometers from the project site and had a magnitude (mb) of 4.4. According to a review of available seismic and geologic literature, no surface disturbance of active faulting occurred at the site as a result of this event.

According to the *Seismic Risk Map of the United States* (Algermissen, 1969), the site lies within Zone 1 (See Figure 3-3, Seismic Risk Map of the United States). Zone 1 is described as: "Minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than 1.0 seconds; corresponds to intensities V and VI of the Modified Mercalli Intensity Scale". An excerpt from the abridged definition of an intensity VI is as follows:

> *"Felt by all; many are frightened and run outdoors; falling plaster and chimneys; damage small."*

Woodward-Clyde (1992a&b) has developed bedrock accelerations, based on seismic and geologic data, appropriate for the design of the proposed dam. Historical evidence suggests that the peak ground acceleration at the site has not exceeded 0.05g during the last 100 years (WCC, 1991). As a result, a conservative estimate of 0.1g or twice the probable historical maximum was chosen in the design as the operating basis acceleration. For the maximum design earthquake (MDE), the design has included a more conservative analysis. This analysis assumed the Steamboat Springs fault was the controlling structure and generated a 6.6 magnitude earthquake (WCC, 1992b). Using this magnitude estimate and distance between potential fault rupture and the Fish Creek site,



SEISMIC RISK MAP OF THE UNITED STATES

ZONE 0 - No Damage.
ZONE 1 - Minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than 1.0 seconds; corresponds to intensities V and VI of the M.M.* Scale.
ZONE 2 - Moderate damage; corresponds to intensity VII of the M.M.* Scale.
ZONE 3 - Major damage; corresponds to intensity VIII and higher of the M.M.* Scale.

This map is based on the known distribution of damaging earthquakes and the M.M.* intensities associated with these earthquakes; evidence of strain release, and consideration of major geologic structures and provinces believed to be associated with earthquake activity. The probable frequency of occurrence of damaging earthquakes in each zone was not considered in assigning ratings to the various zones.

* Modified Mercalli Intensity Scale of 1931.

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FIGURE 3-3

FISH CREEK RESERVOIR EIS

SEISMIC RISK MAP OF THE UNITED STATES

accelerations were determined from existing attenuation relationships. Based on these attenuation relationships, the maximum design acceleration, which corresponds to a MDE of 6.6 on the Steamboat Springs fault, is 0.24g.

3.2.6.2 Geotechnical/Foundation Hazards

Non-earthquake related geotechnical/foundation conditions including differential settlement and seepage/piping through foundation material are possible geologic hazards.

According to Woodward-Clyde (1992b), the main dam embankment is founded on glacially deposited soils except for the cutoff trench extending to bedrock. These subsoils are generally 10 to 20 feet thick, and consist of dense to very dense, slightly to very silty sands and gravels with a medium to large quantity of cobbles and boulders. The soil deposits thicken to about 35 feet on the right abutment. The increase in depth to bedrock at the right abutment is believed to be due to an ancient valley fill channel.

The saddle dam embankment is also reportedly situated on glacially deposited subsoils (WCC, 1991). These subsoils extended about 8 feet below the cutoff trench near the center of the dam.

Seepage in both the main and saddle dams were recorded by Chen (1982), during geotechnical investigations associated with proposed plans to expand the storage capacity of the reservoir.

Seepage occurred about midway down the left (south) abutment of the main dam at its contact with the foundation rock. Seepage downstream of the saddle dam was evidenced by standing water and marshy ground and vegetation. Seepage in the main dam is located along the left abutment and may be attributed to fracture flow in the bedrock unit.

Settlements and or slumping has been minimal according to dam safety records. Minor slumping conditions were observed on the upstream main dam embankment during an August 1991 dam safety inspection.

3.2.6.3 Mass Movement

Mass movements including landsliding, mass wasting, and avalanches generally exist in areas where slope conditions exceed 30 percent. The main dam and saddle dam are situated in relatively flat (< 20 percent) slopes and, therefore pose little risk to mass movements. Portions of the Fish Creek drainage exceed 30 percent slopes, and thus may include mass wasting impacts. Mass movement typically occurs during abnormally wet periods, particularly in the spring. Rockfall is defined as the rapid downward movement of rock fragments by free-falling, rolling, bounding, or sliding in response to the force of gravity. Freeze-thaw action is the major process involved in fracturing rock outcrops and producing rock fragments. Rockfall originates from cliffs of massive, fractured or jointed bedrock and from steep ledges undercut by natural erosion processes or by human activity. Rockfall hazards within the project area are limited to the steep portions of the Fish Creek drainage where the incision of the creek has formed steep bedrock sidewalls.

3.2.7 Flood Hazard

Two recent flood hazard evaluations have been completed for the Fish Creek Dam which predict downstream effects associated with embankment failure. The Colorado School of Mines completed a flood hazard study in 1990 (CSM EPICS) which has been subsequently superseded with a more recent dambreak analysis performed by Woodward-Clyde in 1992 (WCC, 1992c).

The CSM EPICS flood hazard study classifies the Fish Creek Dam as a "Class A, High Hazard" structure. According to the EPICS (1990) study, a flood resulting from the failure of the Fish Creek Dam as it now exists, would result in the loss of approximately 200 homes, several dozen businesses, one of the area's major shopping centers, a retirement home, and 4-5 bridges which would be either lost or seriously damaged.

Woodward-Clyde (1992c), has completed an independent dambreak analysis to assist in the design of an early warning system to evacuate the floodplain areas which would be inundated in case of a dam failure. The dambreak analysis consisted of a breach analysis for the existing dam at normal water elevation of 9,866, (Alternative A) dam raise at normal water elevation of 9,875 (Alternative C) and the proposed dam raise at a normal water elevation of 9,886 (Alternative B). It should be noted that this analysis assumes normal conditions prior to the dam breach which Woodward-Clyde (1992c) considers to be the most likely scenario. If the dam breached during an already existing flood, the water levels would be significantly higher and likely exceeding the 500-year flood levels.

While property damage associated with failure during a flood and/or high precipitation condition is expected to approach that predicted under a 500-year flood (CSM EPICS, 1990), the potential of loss of life is believed to be less because residents living in the flood plain are aware of an on-coming flood due to rainfall conditions (WCC, 1992c).

Woodward-Clyde (1992c), estimates a flood wave 17 feet deep and a peak discharge of 41,000 cfs would reach the water filtration plant in 1.1 hours if there was a failure of the existing main dam at normal water levels. An estimated flood wave 11 feet deep and a peak discharge of 26,200 cfs would reach the downtown area of Steamboat Springs in 1.7 hours if there was a failure of the existing main dam at normal water levels. Projected flood inundation is shown in Figure 3-4, Flood Inundation Map. A copy of Woodward-Clyde's dambreak analysis is presented as Appendix F.

3.3 WATER RESOURCES

3.3.1 Introduction

This section discusses the water resources which may be affected by the Proposed Action and/or the alternatives to the Proposed Action. It contains information pertaining to water supply, project hydrology, water rights, water quality, the existing water system and facilities, water demand, water storage requirements, and water conservation measures presently employed by the City and Mt. Werner. Descriptions of these elements concentrate on the proposed Fish Creek Reservoir expansion area, the Fish Creek drainage basin, and the water service area including Mt. Werner and the City. Further details on water resources are found in the *Water Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992b).

3.3.2 Water Supply

3.3.2.1 Regional Hydrology and Climatology

Fish Creek Reservoir is located approximately 7 miles east of the City of Steamboat Springs, Colorado. The Fish Creek drainage area is tributary to the Yampa River. The Yampa River originates in the headwaters of tributary streams south of the town of Yampa and flows in a northerly direction through Steamboat Springs. It then flows in a westerly direction to the Colorado-Utah border where it joins the Green River. The Green River flows south through eastern Utah to its confluence with the Colorado River southwest of Moab, Utah.

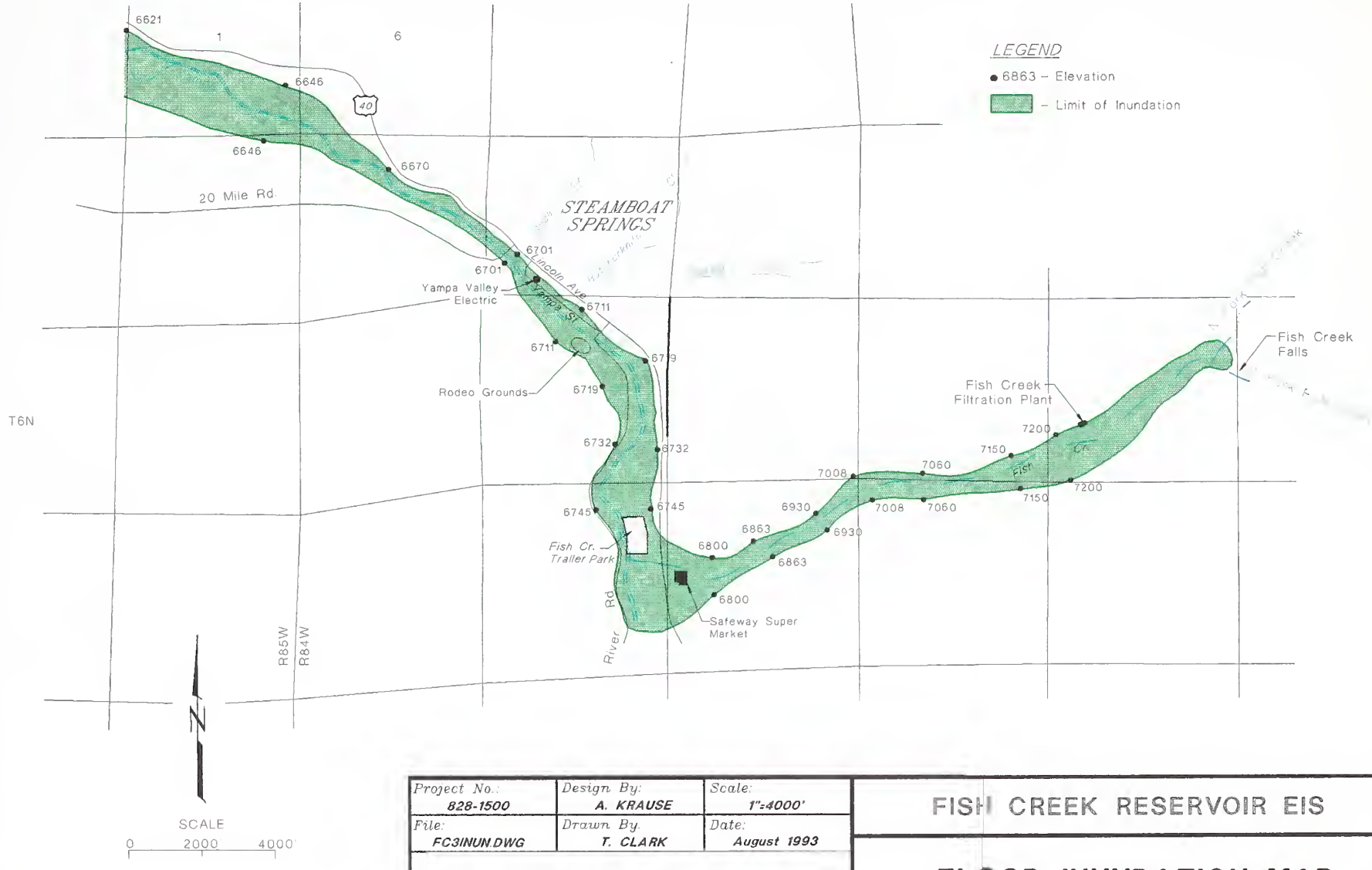
Temperature and precipitation data have been collected in Steamboat Springs since 1908. The average annual temperature for the period 1908 through 1990, is 38.7 degrees Fahrenheit (F). The average daily maximum temperature is 55.5 degrees F, and the average daily minimum temperature is 21.8 degrees F. The average total precipitation for the same period of record is 23.86 inches (SCS, 1992). Most of the annual precipitation falls as snow. The accumulated snowpack in the area supplies the majority of the stream runoff. Climatic conditions in the City of Steamboat Springs, and the surrounding mountain areas, can be substantially different. Average annual temperature at Buffalo Pass (Tower Gage) is 31.23 degrees F for 1987 through 1991. The average daily maximum temperature is 44 degrees F and the average daily minimum temperature is 15 degrees F. The average total precipitation at the Tower Gage is 57.47 inches for 1980 through 1991 (SCS, 1992). Snotel and snow course data is also available at the Tower Gage and is discussed in Section 3.3.2.3.

3.3.2.2 Project Hydrology

The Fish Creek drainage area is located near the Continental Divide, east of the City of Steamboat Springs, in the Routt National Forest. The watershed boundary in the headwaters of this drainage, forms the county line between Routt County to the west of the Continental Divide, and Jackson County to the east of the Continental Divide. North Fork, Middle Fork, and South Fork are the main tributaries to Fish Creek. The watershed has an area of approximately 28 square miles from the headwaters at the divide to its confluence with the Yampa River. The Fish Creek Reservoir is located on the Middle Fork. Figure 3-5, Fish Creek Drainage Basin and Watershed Boundaries, shows the location of the Fish Creek drainage basin. Figure 3-6, Fish Creek Drainage Basin Stream Miles From Yampa, shows stream miles from the mouth of Fish Creek on the Yampa River to the headwaters of each tributary.

The North Fork of Fish Creek originates at the Continental Divide, north of Buffalo Pass at an elevation of 10,724 feet. Buffalo Pass and the Soil Conservation Service (SCS) Tower Gage snow survey site are located along the Buffalo Pass Road at an elevation of approximately 10,300 feet. The North Fork flows in a southwest direction to the confluence with the Middle Fork at elevation 8,320 feet. The drainage area above the confluence with the Middle Fork, is about 10 square miles. The North Fork continues in a southwesterly direction to the confluence with the South Fork just below Fish Creek Falls, elevation 7,520 feet. Channel slope for the North Fork of Fish Creek is approximately 0.09 feet/foot. The total drainage area for the North Fork of Fish Creek, including the Middle Fork, is 17.5 square miles.

The Middle Fork of Fish Creek originates at the Continental Divide at an elevation of 10,566 feet. The Middle Fork flows in a westerly direction to its confluence with the North Fork of Fish Creek. The drainage area of the Middle Fork above the confluence with the North Fork of Fish Creek, is 7.59 square miles at elevation 8,320 feet. The channel slope of the Middle Fork of Fish Creek is

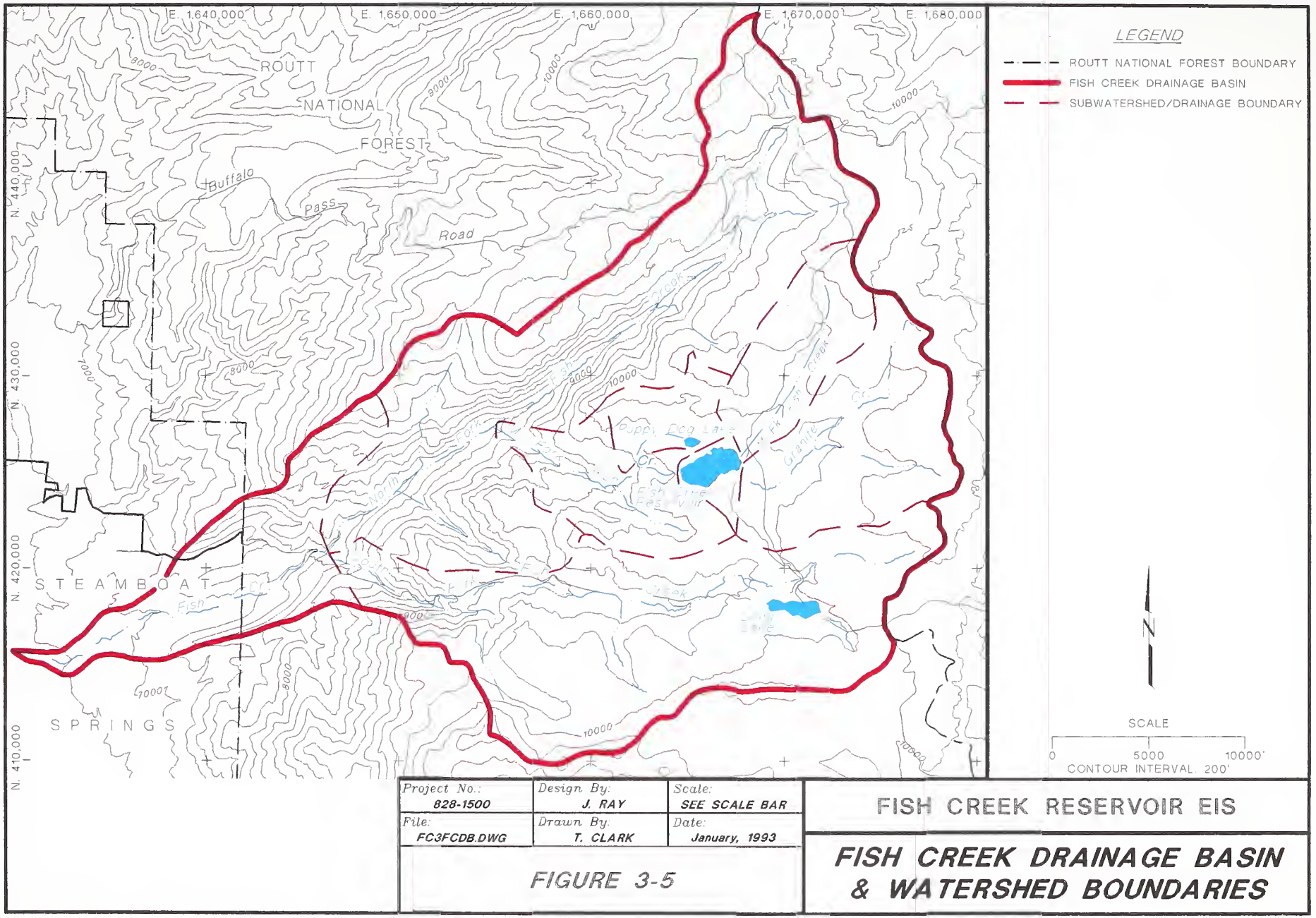


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FIGURE 3-4

FISH CREEK RESERVOIR EIS

FLOOD INUNDATION MAP

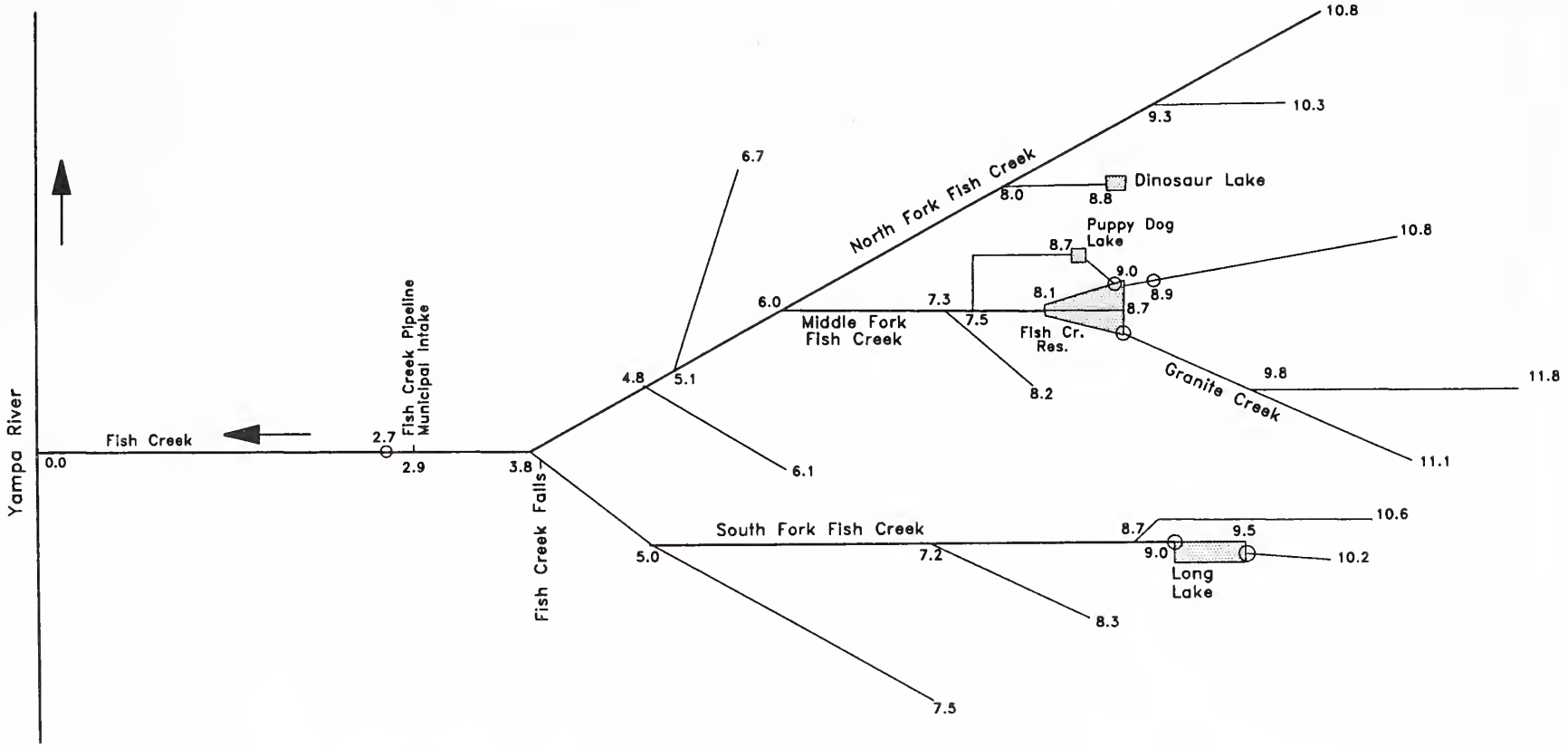


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FIGURE 3-5

FISH CREEK RESERVOIR EIS

FISH CREEK DRAINAGE BASIN & WATERSHED BOUNDARIES



LEGEND

O = Gaging Station

N

SCALE

0 1 MILE

Project No.: 828-1500	*Design By:* J. SHANGRAW	*Scale:* .75" = 1 MILE
File: FC3RVR.DWG	*Drawn By:* T. CLARK	*Date:* AUGUST 1993

FIGURE 3-6

FISH CREEK RESERVOIR EIS

FISH CREEK DRAINAGE BASIN
STREAM MILES FROM YAMPA

approximately 0.09 feet/foot. Fish Creek Reservoir, as discussed in Section 3.2.2, is located on the Middle Fork of Fish Creek and is fed by the Upper Middle Fork of Fish Creek from the northeast and Granite Creek from the southeast.

The drainage area of the Upper Middle Fork is 1.56 square miles with an elevation range from 10,566 feet to 9,866 feet, the normal water level elevation in Fish Creek Reservoir. Granite Creek has a drainage area of 3.2 square miles with an elevation range from 10,440 feet to 9,866 feet (normal reservoir water level elevation). The drainage area above the dam on the Middle Fork of Fish Creek, including the area of Fish Creek Reservoir, is 5 square miles. The spillway drains to the Puppy Dog Lake drainage, which has an area of 0.8 square miles and an elevation range from 10,398 feet to 9,440 feet. The channel slope of the Puppy Dog Lake drainage from the spillway to the confluence with the Middle Fork is approximately 0.12 feet/foot. The Middle Fork of Fish Creek joins the North Fork approximately two miles downstream of the main dam.

The South Fork of Fish Creek flows west from its headwaters at the Continental Divide. Elevation of the drainage ranges from 10,417 feet to 7,520 at Fish Creek Falls. The South Fork has a channel slope of approximately 0.08 feet/foot and a drainage area of 7.8 square miles. Long Lake Reservoir is located in the upper reaches of the South Fork of Fish Creek and has a capacity of 396 AF. The South Fork of Fish Creek joins the North Fork approximately 5 miles downstream of Long Lake just below Fish Creek Falls.

Fish Creek continues flowing in a southwesterly direction approximately 3.8 miles, to its confluence with the Yampa River. The drainage area for the lower reaches of Fish Creek (Fish Creek Falls to the Yampa River) is 3 square miles. The elevation ranges from 7,520 feet at Fish Creek Falls to approximately 6,720 feet at the confluence with the Yampa River. Channel slope in this reach is approximately 0.04 feet/foot. The diversion point for the water filtration plant is located 0.9 miles downstream of Fish Creek Falls.

3.3.2.3 Project Climatology

In addition to temperature and precipitation data collected in Steamboat Springs and at Buffalo Pass, snow survey data has been collected at Buffalo Pass and has been used to predict average and low flow conditions at the Fish Creek Reservoir site. The SCS has maintained three snow course stations in the general vicinity of Fish Creek Reservoir. The Tower gage at Buffalo Pass, located within the North Fork of the Fish Creek drainage basin, was used for these predictions. The Tower station has an average snow water equivalent (SWE) of 50.3 inches over a period of record from 1961 through 1990 (SCS, 1992) as shown in Table 3-2, Snow Water Equivalents. The total annual precipitation of 57.47 inches includes the SWE of 50.3 inches as well as precipitation from rainfall events during the summer months. Snotel data, automated daily precipitation and snow water equivalent data, have also been collected at the Tower site and ten years of data are available for the period 1980 through 1990. The average snow water equivalent at the snotel site is 45.43 inches. The snotel data is considered more detailed and more reliable than the snow course data (SCS, 1992). It is estimated that approximately 85 percent of the snow water equivalent at the Tower site could be expected at Fish Creek Reservoir. Of this 85 percent of the water content, 25 percent is estimated to be lost to evapo-transpiration and seepage, and 75 percent is predicted to be available for runoff, which would flow through Fish Creek Reservoir (D&D, 1983). Based on these estimates, the runoff volume for the Fish Creek drainage at the dam, with an area of 5 square miles, would be 8,550 AF using the average SWE from the snow course data and 7,723 AF using the average SWE from the snotel data.

TABLE 3-2
SNOW WATER EQUIVALENTS (SWE)
TOWER GAGE

Date	SWE - Inches Snow Course	SWE - Inches Snotel
Average 1961-1990	50.3	
Average 1980-1990		45.43
April 1, 1977	25.4	
*April 1, 1981	30.1 (10 year low flow)	23.8
*10-year low flow event		

Drought years for the period of record were 1977 and 1981. The minimum SWE measured at the snow course was 25.4 inches on April 1, 1977. Data at the snotel site was not collected during 1977. The SWE measured at the snow course in April 1981 of 30.1 inches, is considered the 10-year low flow event. In a given 100-year period, there would be 10 years when the snow water content would be less than observed in April 1981 (D&D, 1983). The corresponding 10-year low flow SWE at the snotel site was 23.8 inches. Estimating the water yields from the 10-year low flow event in the same manner as the average SWE results in a runoff volume at the dam of 5,120 AF and 4,050 AF, respectively using the snow course and the snotel site data. A 25-year low flow event means that during a 100-year period this water content or less would be expected to occur four times. The 25-year low flow event is predicted to be approximately 21 inches and would have a corresponding water yield at Fish Creek of 3,570 AF.

Annual evaporative losses from the Fish Creek Reservoir are expected to be less than 25 inches/year (Duskin, 1992). Since evaporative losses are less than the amount of precipitation, there is no net evaporative loss. Evaporative losses could range from 6 inches per year to 20 inches per year. No site specific data, however, is available. Estimated evaporation over the existing average surface area (92.5 acres) of the reservoir could range from approximately 45 to 150 AF per year. Applying the same evaporation rates to Long Lake Reservoir, with a surface area of 57 acres, would yield evaporation rates ranging from approximately 28 to 95 AF per year.

3.3.2.4 Stream Flow Regime

Stream flow has been monitored by the U.S. Geological Survey at six locations within the Fish Creek drainage area. These locations include the South Fork of Fish Creek at the inlet to Long Lake Reservoir (09238705), the South Fork of Fish Creek below the Long Lake spillway (09238710), the Middle Fork of Fish Creek above the Fish Creek Reservoir (09238750), Granite Creek above Fish Creek Reservoir (09238770), the Middle Fork of Fish Creek tributary (Puppy Dog Lake) at the Fish Creek Reservoir spillway (09238800), and Fish Creek below the municipal intake (09238900). Period of record varies for these stations. All of the stations, with the exception of the inlet to Long Lake and Fish Creek below the municipal intake, have a period of record from August, 1984 to the current year. Monitoring commenced at the inlet to Long Lake in October 1986. The lower Fish Creek station was monitored from October 1966 through September 1972, and was reinstated in May, 1982. A summary of flow records for these stations is found in Table 3-3, Summary of U.S. Geological Survey Stream Flow Records.

TABLE 3-3
SUMMARY OF U.S. GEOLOGICAL SURVEY STREAM FLOW RECORDS

Station Name	Period of Record	Drainage Area (mi^2) at Station Location	Average Flow for Period of Record (cfs)	Maximum Flow for Period of Record (cfs)	Minimum Flow for Period of Record (cfs)
09238705 Long Lake inlet near Buffalo Pass	October, 1984 to current year	0.71	*1.4 (980 AF/year) (avg for 1984-1991 only)	62 - (June 16, 1988)	0- (17 days 1988)
09238710 Fish Creek Tributary below Long Lake	August, 1984 to current year	1.03	1.7 (1,260 AF/year)	81 - (June 14, 1991)	0 - (many days each year)
09238750 Middle Fork Fish Creek near Buffalo Pass	August, 1984 to current year	1.37	3.97 (2,880 AF/year)	126 - (June 15, 1991)	0 - (February 17-20, 1988)
09238770 Granite Creek near Buffalo Pass	August, 1984 to current year	2.82	6.94 (5,028 AF/year)	126 - (June 11, 1990)	0.13 - (March 21, 1988)
09238800 Middle Fork Fish Creek Tributary below Fish Creek Reservoir (spillway)	August, 1984 to current year	4.78	7.78 (5,640 AF/year) 40 cfs (active flow period rather than annual - See section 2.4)	195 - (June 16, 1991)	0 - (many days each year)
09238900 Fish Creek at Upper Station, near Steamboat Springs	October, 1966 to September, 1972 May, 1982 to current year	24.8	*54.47 (38,800 AF/year) (avg for 1984-1991 only)	1,110 - (June 20, 1968)	0.01 - (August 7, 1972)

* No average given in USGS, 1991. Data is from daily flow records obtained from the City for these USGS stations. Averages were calculated from daily records.

(USGS, 1991)

Stream flow estimates at the Fish Creek Reservoir outlet into the Middle Fork of Fish Creek, ranging from 0 to approximately 11 cubic feet per second (cfs), have been recorded by City personnel. During September and October 1992, the reservoir was drained for maintenance at an estimated rate of approximately 20 cfs. An average discharge rate from the reservoir over the period from 1977 through 1992, was approximately 3 cfs. Measurements of stream flow from the outlet are taken several times a month during the months of July through October. Flows at the outlet monitoring site are not always captured in the existing flume, if flows are greater than 10 cfs. Therefore, outlet flow values are estimates only for flows greater than 10 cfs.

3.3.2.5 Peak Flow Estimates

As discussed in section 3.2.4, Fish Creek Dam is classified as a "Class A, High Hazard" structure. The structure is greater than 20 feet in height and its failure would likely result in a loss of life downstream. Peak flow estimates for the Probable Maximum Precipitation (PMP) event were required in the design of the Fish Creek Reservoir. The inches of precipitation from the PMP with a 6-hour duration were 12.5 for a general type storm, and 9.2 for a local type storm. Resulting peak flow estimates were 3,230 cfs for the general type storm, and 4,809 cfs for the local type storm (D&D, 1983). The total volume of flow in a general type storm is larger than the local type storm. However, the time required to reach the peak in the local type storm is shorter and the peak flow is greater than the general storm.

3.3.2.6 Stream Channel Characteristics

The Middle Fork of Fish Creek below the reservoir is a bedrock controlled channel. The channel is stable and erosion potential slight. The channel carries a higher than normal sediment load downstream of the confluence with Puppy Dog Lake channel for a distance of approximately 0.25 miles. Along this 0.25 mile stream segment, extensive bedload depositional features are apparent. The integrity of the Fish Creek channel downstream of the influence of Puppy Dog Lake channel is good. Banks are stable with heavily wooded and vegetated areas and the channel does not show evidence of excessive erosion.

The Puppy Dog Lake drainage, downstream of the Fish Creek Reservoir spillway, shows signs of long-term bank and channel erosion. The spillway from Fish Creek Reservoir during the months of May, June and July, contributes large volumes of water into the 0.8 square mile drainage area of Puppy Dog Lake, causing considerable erosional damage to the channel. This small watershed receives flows much greater in magnitude than would normally occur in the basin, which causes the stream channel to adjust to the larger flows. These adjustments result in erosional damage. As an example, the average monthly flow from the spillway to Puppy Dog Lake drainage during June 1991 was 82.2 cfs, or 103 cfs per square mile. During that same time period, the average discharge in Granite Creek (located upstream of the reservoir), was 50.9 cfs, or 18 cfs per square mile. Flow on June 16, 1991 of 195 cfs was the maximum discharge for the period of record. Large magnitude discharges from the spillway have changed the natural character of the channel. The channel is approximately 60 feet wide, approximately 1,000 to 2,000 feet downstream of the outlet from Puppy Dog Lake. Evidence of erosion from the extreme flows during June 1991, could be seen on the north banks of the channel. Active bank erosion and several uprooted trees on the north bank were evidence of large magnitude flows.

No information exists to document the Puppy Dog Lake stream channel prior to construction of the reservoir. From the characteristics of the surrounding drainage, it can be assumed that the pre-existing channel was probably a small meandering meadow type stream. The stream channel was

probably stable with riparian vegetation along the upper and lower banks. The adjustments that the channel has had to make to accommodate the increased spillway flow volumes once the reservoir was constructed have caused adverse changes in the channel. The progressive stages of channel adjustments have changed the stream to a gully type stream system.

The energy available within the stream channel is increased due to the increased volume of water from the spillway flows during spring runoff. As the velocity increases, the size of the particle that can be transported also increases. This causes the stream to downcut or become incised. As the downcutting proceeds, the channel slope increases due to the stream becoming less sinuous. As the stream becomes more incised, year after year, there is no longer an opportunity for the increased flows to spread out over the upper banks which dissipates the erosive effects of the high flows. The stream energy is confined within the channel which causes additional channel erosion every year. The stream adjusts laterally within the incised channel increasing the width of the channel in the bottom of the confined stream bed. Vegetation does not become established in a gully type stream system. The channel is currently unstable, deeply incised in some locations, with an absence of riparian vegetation along the upper and lower banks.

3.3.2.7 Existing Operation of Fish Creek Reservoir

Fish Creek Reservoir has a total storage capacity of 1,842 AF of water and a surface water area of approximately 90 acres. The normal water level elevation within the reservoir is 9,866 feet. The embankment crest elevation of the main dam is 9,874 feet and 9,871.5 feet for the saddle dam. The spillway is constructed to contain the probable maximum precipitation event (PMP) with one foot of freeboard.

The recent operation of the Fish Creek Reservoir can be described as an annual cycle of storage and release. The reservoir is filled by runoff and snowmelt from the 5.0 square mile Middle Fork of the Fish Creek watershed, including the Granite Creek and Upper Middle Fish Creek tributaries, from April until the end of May or the beginning of June, when the spillway into the Puppy Dog Lake drainage begins to flow. The average flows recorded for the period of record can be misleading at the spillway gaging site since a vast majority of the runoff occurs over the three-month period of May, June, and July. Averages in Table 3-3 are calculated over the period of a year. Flow from the spillway occurs for an average (7-year period of record) of 71 days a year. Average flow when the spillway is active for water years 1984 through 1990 is 40 cfs. As shown in Table 3-3, the maximum flow for the period of record was 195 cfs.

The outlet works at the main dam are adjusted in July to release approximately 4 to 5 cfs of storage water to the existing flow in the Middle Fork of Fish Creek for the summer irrigation season and to allow release of inflow from the upper tributaries. Flow from the outlet is reduced in the late fall to approximately 2 to 3 cfs (Birch, 1992b). Drawdown from storage during the fall and winter months (August through April or May) is approximately 1,000 to 1,200 AF per year (Birch, 1992a).

3.3.2.8 Existing Operation of Long Lake Reservoir

Long Lake Reservoir has an active storage capacity of 396 AF and a surface water area of 57 acres. The normal water level elevation within the reservoir is approximately 9,850 feet. The embankment crest elevation of the main dam is approximately 9,853 feet. The active spillway channel is 10 feet wide. However, the effective spillway channel width is several hundred feet.

Long Lake Reservoir is used to augment the storage capacity in Fish Creek Reservoir. Approximately 25 percent of the total water storage released by the City annually comes from Long Lake. Long Lake is also a backup water supply used when Fish Creek Reservoir requires maintenance. The reservoir is filled by runoff and snowmelt from a drainage area of approximately 0.71 square miles from April until the end of May or the beginning of June. The reservoir outlet normally remains open throughout the year. The spillway flows from approximately June through July. Inflow to the reservoir drops in August and the spillway does not flow. Flows of approximately 1 cfs are released through the outlet structure from August through the winter. Annual drawdown from storage in Long Lake is approximately 300 AF. Some dead storage exists when the reservoir is completely drained (Birch, 1992a).

3.3.3 Water Rights

The City and Mt. Werner own a portfolio of direct flow water rights and storage water rights on Fish Creek and other area streams. The following sections will discuss direct flow rights, storage rights, and water rights outside of the Fish Creek drainage. Both the City and Mt. Werner have groundwater rights tributary to the Yampa River. Figure 3-7, Water Rights, shows the location of water rights within the Fish Creek drainage.

3.3.3.1 Fish Creek Direct Flow Water Rights

A summary of Fish Creek direct flow water rights by priority, using the administration number, which has recently replaced the use of basin rankings, is shown in Table 3-4, Summary of Fish Creek Direct Flow Water Rights.

All of the direct flow water rights owned by the City have been consolidated to a diversion point at the water filtration plant. The Fish Creek Municipal Intake consists of water rights with adjudication dates ranging from 1892 to 1972. Water rights transferred from the Hoyle and Knight ditch, the Welch and Waters ditch, and the Batton ditch, have all been changed to divert from the municipal intake. The total direct flow rights available to the City at the intake is 15.088 cfs. The City has a 25 percent share of the senior 8.3 cfs Fish Creek direct flow water rights.

Mt. Werner has also consolidated all of its direct flow water rights to the Fish Creek Municipal Intake. The sources for the transfers include the Hoyle and Knight ditch, the Welch and Waters ditch, and Park City Number (No.) 2 ditch. Mt. Werner has direct flow water rights totaling 21.888 cfs. It has dedicated 7.1 cfs of this total to the Colorado Water Conservation Board, as indicated in Table 3-4. Mt. Werner has a 63 percent share of the senior 8.3 cfs Fish Creek direct flow water right.

Table 3-4 lists water rights from the highest to the lowest priority within the basin. The first four water rights listed in the tabulation comprise the original Hoyle and Knight water right for 8.3 cfs. As discussed previously, the City has a 25 percent share and Mt. Werner a 63 percent share of this senior water right. The remaining 12 percent share of the original Hoyle and Knight water right is owned by a private party. During periods of low flow, only this Hoyle and Knight first right of 8.3 cfs is in priority. Therefore, the three owners of this right must abate proportionately when the flow in Fish Creek drops below 8.3 cfs. During this period, there is not sufficient water within Fish Creek to meet municipal water demands, and consequently, water must be released from storage.

TABLE 3-4
SUMMARY OF FISH CREEK DIRECT FLOW WATER RIGHTS
ADMINISTRATIVE LISTING

Administration No.	Diversion Structure Name	Amount (cfs)	Use	Source and Comments	Diversion Structure Total (cfs)
14466.00000	Fish Cr Mun Water Intake	2.00	Mun.	Steamboat Springs from Hoyle & Knight	2.00
14466.00000	Fish Cr Mun Water Intake	5.12	Many	Mt. Werner from Hoyle & Knight	7.12
14466.00000	Fish Cr Mun Water Intake	0.176	Mun.	Mt. Werner & Steamboat Springs from Hoyle & Knight	7.3
14466.00000	Hoyle & Knight D	1.00	Irr.	7.124 cfs to Fish Cr Pl, 0.176 cfs to Fish Cr Mun intake*	1.00
19985.18830	Albert A Mann D	0.370	Irr., Rec. Fishery Stock	From Welch & Waters	0.370
19985.18830	Fish Cr Mun Water Intake	1.30	Fire, Dom.	Steamboat Springs.from Welch & Waters	8.6
19985.18830	Fish Cr Mun Water Intake	1.74	Irr.	Mt. Werner from Welch & Waters	10.3
22438.22048	Fish Cr Mun Water Intake	2.56	Irr.	Mt. Werner from Hoyle & Knight; 2 cfs dedicated to CWCB	12.9
22544.22156	Fish Cr Mun Water Intake	3.42	Irr.	Mt. Werner from Welch & Waters	16.3
23646.15888	Park City Main Lat 1	0.330	Irr.	Park City Decree from Albert A Mann	0.330
23646.21742	Albert A Mann D	1.33	Irr., Rec. Fishery Stock	Change of Use	1.7
23646.22531	Albert A Mann D	0.660	Irr., Rec. Fishery Stock	Change of Use	2.36
25392.21742	Albert A Mann D	1.25	Irr., Rec. Fishery Stock	Change of Use	3.61
26805.26495	Fish Cr Mun Water Intake	1.5	Fire, Dom.	Steamboat Springs from Fish Cr Pl	17.8
33782.19875	Alma M Baer Feeder Ditch	0.336	Irr.		0.366
34546.00000	Fish Cr Mun Water Intake	2.10	Irr.	Mt Werner from Welch & Waters; dedicated to CWCB	19.9
35320.33181	Fish Cr Mun Water Intake	3.00	Irr., Dom.	Steamboat Springs from Batton & Batton	22.9
35320.35215	Fish Cr Mun Water Intake	3.70	Irr., Dom.	Steamboat Springs from Batton & Batton	26.6
37688.283972	Fish Cr Mun Water Intake	1.00	Stock	Mt Werner from Hoyle & Knight; dedicated to CWCB	27.6
37688.33723	Fish Cr Mun Water Intake	1.00	Stock	Mt Werner from Hoyle & Knight; dedicated to CWCB	28.6
39254.20223	Park City Main Lat 1	0.30	Irr., Dom.	0.4 cfs to Fish Cr Park Well No. 1, 0.3 cfs to Well No. 2	0.63

TABLE 3-4
SUMMARY OF FISH CREEK DIRECT FLOW WATER RIGHTS
ADMINISTRATIVE LISTING

Administration No.	Diversion Structure Name	Amount (cfs)	Use	Source and Comments	Diversion Structure Total (cfs)
39254.20223	Fish Cr Park Well No. 1	0.40	Mun., Fire Dom.	From Park City No. 1 Actually Alt Point of Diversion	0.40
39254.20223	Fish Cr Park Well No. 2	0.40	Mun., Fire Dom.	From Park City No. 1 Actually Alt Point of Diversion	0.30
40329.00000	Alma M Baer Feeder Ditch	1.50	Irr.		1.87
41457.00000	Fish Cr Mun Water Intake	1.00	Irr.	Mt Werner from Park City No. 2; dedicated to CWCB	29.6
41851.00000	Fish Cr Mun Water Intake	3.50	Irr., Mun., Dom.	Steamboat Springs from Fish Cr Pl	33.10
42156.00000	Fish Cr Mun Water Intake	1.16	Irr., Mun., Dom.	Mt. Werner from Mt Werner Pl	34.30
42156.00000	Fish Cr Mun Water Intake	2.70	Irr., Mun., Dom.	Mt. Werner from Mt Werner Pl	37.00
42925.00000	Green Well & Pl	0.50	Irr., Dom., Stock		0.50
44559.20223	Park City Main Lat 1	1.67	Irr., Stock		2.30
44925.41829	Clayson Well 1	0.252	Irr.		0.252
46652.00000	Fish Cr MSF	3.50	Minimum Stream Flow	Outlet Long Lake to No Fk Fish Cr	4.00
47189.00000	Fish Cr MSF Lower	2.00	Minimum Stream Flow	Mt Werner Pl to Yampa River	2.00
47189.00000	Fish Cr MSF	3.50	Minimum Stream Flow	Conf No Fk to Mt Werner Pl	9.00
50769.50604	Lodwick Pond Outlet D	2.00	Irr., Rec., Fishery Stock		2.00

Notes: No direct flow rights less than .1 cfs have been included.
Listing includes direct diversions only.
Listing includes absolute rights only.
*Steamboat Ski Corp has first right of refusal and Mt. Werner has the second right of refusal for the purchase of this right

(Colorado Division of Water Resources, Division 6, 1992)

The Sheraton Golf Course has an agreement with Mt. Werner to use an existing portion of Mt. Werner direct flow rights in Fish Creek for irrigation of the golf course. Administratively, Sheraton Golf Course diversions are monitored by the Colorado Division of Water Resources, however, the water right is still retained by Mt. Werner (Holt, 1992a).

There are several active direct flow rights remaining in the Fish Creek drainage that are not owned by the City or Mt. Werner. As discussed above, a private party owns a 12 percent share (or 1.0 cfs) of the original Hoyle and Knight direct flow water right, with an adjudication date of 1892. The Albert Mann ditch has a total of 3.61 cfs for irrigation and recreation use with adjudication dates ranging from 1904 through 1919.

The Alma Baer Feeder ditch has a total of 1.866 cfs for irrigation with adjudication dates of 1946 and 1964. The Park City Main Lat. No. 1 has a total of 2.3 cfs for irrigation and stock use with an adjudication date of 1964. Two wells, Park City Well No. 1 and 2, decreed for 0.4 and 0.3 cfs, respectively, and adjudicated in 1964 have been transferred from the Park City Main Lat. No. 1 as alternative points of diversion. The Lodwick Pond ditch has a 1989 adjudication date for 2.0 cfs for irrigation and recreational purposes. The source of water for this ditch is actually the Albert Mann ditch (Holt, 1992b).

The Delonge and Kelly ditch has a headgate on the North Fork of Fish Creek. This water right is decreed for 4 cfs with an adjudication date of 1901 for irrigation and domestic use. The Goumaz and Hang ditches are adjudicated in the Little Fish Creek drainage for a total of 3.3 cfs. The source for these water rights is the Delonge and Kelly ditch, not Little Fish Creek where they are physically located. Because the source for these water rights is another adjudicated water right, they are administered through the Delonge and Kelly ditch (Holt, 1992b).

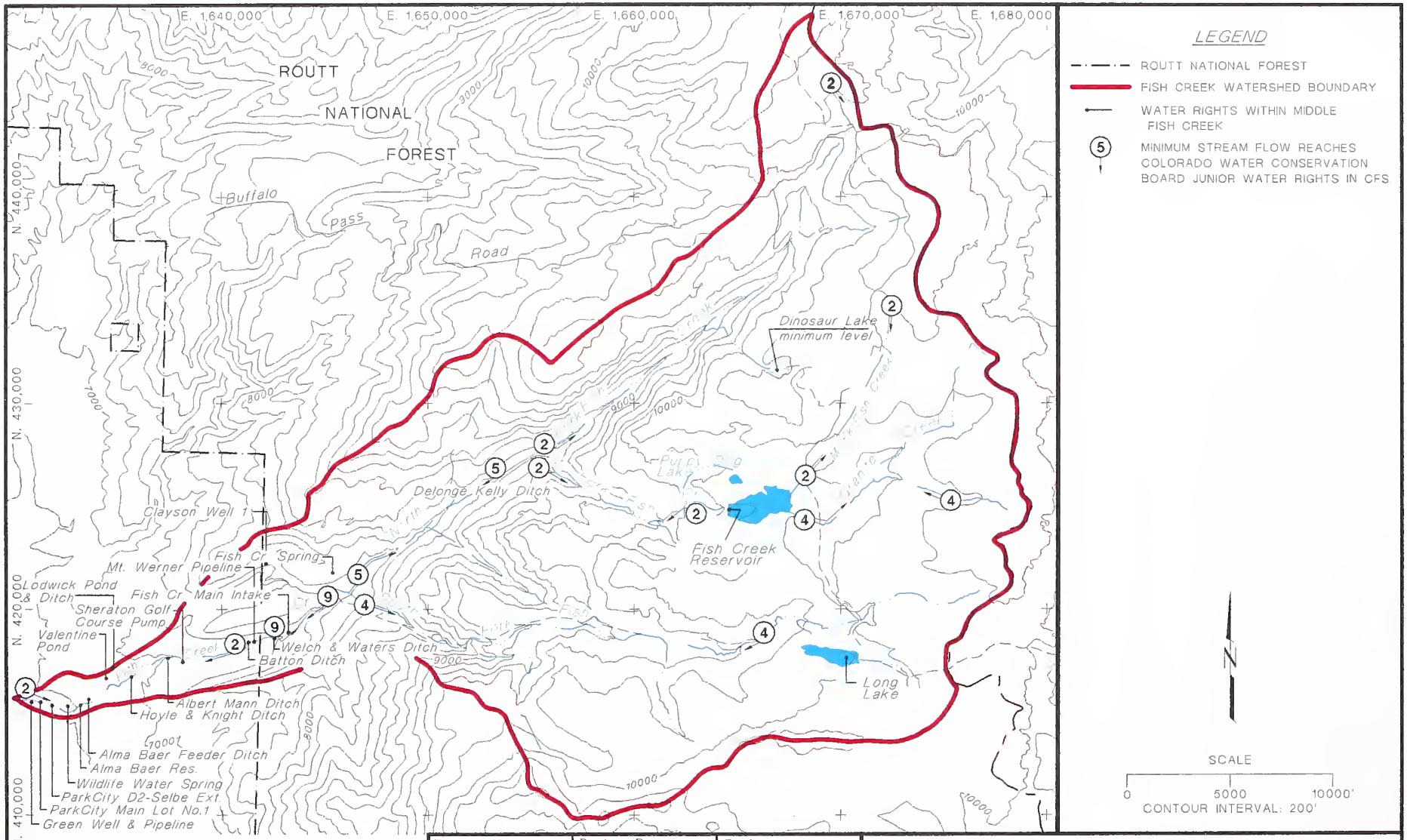
The Green Well and Pipeline was adjudicated in 1972 for 0.5 cfs for irrigation, domestic and stock use. The Green Well is located near the mouth of Fish Creek. The Clayson Well 1 is located in the Little Fish Creek drainage and is used for irrigation. It has an adjudication date of 1972 for 0.252 cfs.

Several springs are also adjudicated in the Fish Creek drainage. Wildlife Water Spring adjudicated in 1987 for 0.033 cfs for "other" use, and Fish Creek Spring for a total of 1.004 cfs on the North Fork, adjudicated in 1975 for domestic use.

Four Counties Water has a total of 573 cfs listed in the July 1992 water rights tabulation. However, all of these rights have been transferred out of the Fish Creek Basin. Alternative points of storage and diversion were previously decreed for these rights outside of the Fish Creek Basin. However, the City may obtain a portion of the Four Counties Rights on Fish Creek from the Upper Yampa Water Conservancy District for use on the proposed project.

3.3.3.2 Fish Creek Minimum Stream Flow Rights

Minimum stream flow rights have been adjudicated at eight points within the Fish Creek drainage by the Colorado Water Conservation Board (CWCB). These rights are junior to the City and Mt. Werner's direct flow rights, and also to the City's existing storage rights. They are senior to the conditional storage right on Fish Creek for 2,000 AF. However, no objection by the CWCB was made at the time of application by the City for the 2,000 AF storage right. An additional 200 AF storage right was filed in August 1992 by the City. The CWCB rights are senior to this filing.



Project No.:	Design By:	Scale:
828-1500	J. SHANGRAW	SEE SCALE BAR
File:	Drawn By:	Date:
FC3WBWR.DWG	T. CLARK	August 1993

FIGURE 3-7

FISH CREEK RESERVOIR EIS

WATER RIGHTS

Listed below in Table 3-5, Minimum Stream Flow Rights, by drainage, are the locations, amounts and adjudication dates of these rights. Figure 3-7 shows the stream reaches affected by minimum stream flow rights.

TABLE 3-5
MINIMUM STREAM FLOW RIGHTS

Reach Location	Amount, in cfs	Adjudication Date
Outlet of Long Lake to confluence of South Fork Fish Creek with North Fork	4.0	12/31/77
Mt. Werner PL to Yampa River	2.0	12/31/79
Confluence of North Fork to Mt. Werner PL	4.0	12/31/79
Headwaters of Granite Creek to Fish Creek Reservoir	4.0	12/31/77
Headwaters of Middle Fork to Fish Creek Reservoir	2.0	12/31/77
Fish Creek Reservoir to confluence with North Fork Fish Creek	2.0	12/31/77
Headwaters of North Fork to confluence with Middle Fork Fish Creek	2.0	12/31/77
Confluence of Middle Fish Creek to Fish Creek below falls	5.0	12/31/77

3.3.3.3 Fish Creek Storage Rights

The City of Steamboat Springs owns 99 percent of the storage rights on the Middle Fork of Fish Creek and the South Fork of Fish Creek. Fish Creek Reservoir on the Middle Fork of Fish Creek has three adjudicated storage rights: 1,175.43 AF (1946), 666.63 AF (1964), and 2,000 AF (1980). An additional storage right was filed in August 1992 by the City for 200 AF.

The Colorado Water Conservation Board has filed an objection to this most recent 200 AF filing. Two minimum stream flow rights (adjudication dates 12/31/77) located at the inlet to Fish Creek Reservoir on approximately 100 feet of the Middle Fork of Fish Creek and Granite Creek, would be inundated by the 200 AF filing. The two parties have settled this objection through an agreement dated December 31, 1992 which is included as Appendix G. According to the agreement, the City would use the 200 AF of storage capacity to release water during low flow periods for the maintenance of in-stream flows downstream of the Fish Creek Water Filtration Plant. The Colorado Division of Water Resources would administer this arrangement (Holt, 1993). Additionally, the City would use its "best efforts" to improve aquatic habitat in lower Fish Creek by constructing habitat improvement structures, in an amount not to exceed $10,000.

The City also owns storage rights to Long Lake in the amount of 395.6 AF, with an adjudication date of 1946. Several additional conditional water rights are still listed in the tabulations for the Fish Creek basin; one for 308.1 AF and another for 455.0 AF. It is unlikely that these conditional rights will be exercised.

Mt. Werner Water and Sanitation District does not independently own any storage rights in Fish Creek or Long Lake.

Several other entities own storage rights in the Fish Creek basin. Dinosaur Lake, located on the North Fork of Fish Creek, has an adjudication date of 1976 for 130.5 AF for a fishery. This water right was filed by the Colorado Water Conservation Board to maintain a minimum lake level in Dinosaur Lake. The Lodwick Pond, located in the lower reaches of Fish Creek, below the water filtration plant, has an adjudication date of 1989. It was decreed for 13.03 AF for irrigation, recreation, and fishery use. The Albert Mann ditch supplies water to Lodwick Pond. The Valentine

Pond was decreed in 1989 for 1.82 AF for irrigation and recreation uses. It is located just southwest of Lodwick Pond. Alma Baer Reservoir, located downstream of Valentine Pond, is decreed for 2.59 AF with a 1946 adjudication date for fishery and domestic use.

3.3.3.4 Water Rights Outside of The Fish Creek Drainage

Both the City and Mt. Werner own water rights in other basins. The City has water rights in the Spring Creek, Soda Creek, and Stuckey Creek basins. The City has converted these rights in order to use raw water, rather than treated water, for irrigation within the City park system. At present, the City has conditional alluvial ground water rights along the Yampa River for its infiltration gallery (Holt, 1992b).

Mt. Werner owns surface water rights on Burgess Creek, and Walton Creek. These water rights are rarely, if ever, used. Absolute ground water rights for Mt. Werner total 6.78 cfs. Mt. Werner also has a conditional water right for an additional 0.71 cfs. These ground water rights are located in alluvium near the confluence of Walton Creek and the Yampa River (Holt, 1992b).

Both the City and Mt. Werner lease water storage in Stagecoach Reservoir, located approximately 5 miles southeast of the town of Oak Creek, Colorado. The City and Mt. Werner have long-term (thirty year) renewable leases of 500 AF and 200 AF of water storage, respectively.

Mt. Werner also leases water storage in Yamcolo Reservoir, located in the headwaters of the Yampa River upstream of Stagecoach Reservoir. Mt. Werner has a thirty year renewable lease of 300 AF of water storage in Yamcolo.

3.3.4 Water Quality

3.3.4.1 Fish Creek

The City and Mt. Werner obtain their water supply primarily from the high mountain snowmelt sources of the Fish Creek drainage basin. As discussed previously, the City and Mt. Werner own direct flow rights on Fish Creek and the City owns storage rights on Fish Creek Reservoir. Fish Creek Reservoir and Fish Creek, flowing through National Forest lands are designated as High Quality 2 and thus, warrant special protection and review by the Colorado Department of Health (CDH) Water Quality Control Division (WQCD) in order to maintain the existing water quality.

Fish Creek and Fish Creek Reservoir are classified as:

- Aquatic Life Cold 1
- Recreation 1
- Water Supply
- Agriculture

Water quality standards associated with these classifications are presented in Table 3-6.

This highly oxygenated water source is characterized by low alkalinity and hardness and a neutral pH. The water is low in naturally-occurring earth minerals, metals, and organic material. In general, the water is low in turbidity and dissolved solids. During spring snowmelt, however, the concentrations of these parameters tend to increase slightly (Peterson, 1992).

TABLE 3-6
WATER QUALITY STANDARDS

Physical and Biological	Inorganic (mg/l)		Metals (mg/l)		
dissolved oxygen=6.0 mg/l dissolved oxygen(sp)=7.0 mg/l pH=6.5 - 9.0 fecal coliforms=200/100ml	un-ionized ammonia as N (ac)=0.43 /FT/FPH/2 un-ionized ammonia as N (ch)=0.02 residual chlorine=0.003 free cyanide=.005 sulfide as undissociated H_2S (hydrogen sulfide)=0.002	boron=0.75 nitrite as N=0.05 nitrate as N=10.0 chloride=250.0 sulfate=250.0	arsenic(ac)=50(Trec) cadmium(ac)=TVS(tr) cadmium(ch)=TVS trivalent chromium(ac)=50 (Trec) hexavalent chromium(ac/ch)=TVS hexavalent chromium(ch)=TVS copper(ac/ch)=TVS	iron(ch)=300(dis) iron(ch)=1,000(Trec) lead(ac/ch)=TVS manganese(ch)=50(dis) manganese(ch)=1,000(Trec) mercury(ch)=.01(Trec) nickel(ac/ch)=TVS	selenium(ac)=10(Trec) silver(ac)=TVS silver(ch)=TVS(tr) zinc(ac)=TVS zinc(ch)=TVS

ac=acute
ch=chronic
dis=dissolved
mg/l=milligrams per liter
ml=milliliters
N=nitrogen
SP-spawning
tr=trout
Trec=total recoverable
TVS=table value standard

Fish Creek Reservoir is a high quality water source. The management prescription for the area surrounding the reservoir, as identified in the *Routt National Forest Land and Resource Management Plan* is 10E which provides for management of municipal and supply watersheds. A general description and goals of the 10E prescription are as follows:

> *"Management emphasis is to protect or improve the quality and quantity of municipal water supplies. Management practices may vary from use restrictions to water resource improvement practices, with the primary object of meeting water quality standards established from the individual watershed. A secondary objective is to manage the watershed to improve the yield and timing of water flows, consistent with water quality requirements (USDA Forest Service, 1983)"*

Several additional uses are permitted in the area. The area is utilized as a recreation resource, as discussed in the *Baseline Recreation Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992). Additionally, grazing is presently permitted in the area as discussed in the *Vegetation and Range Technical Memorandum for the Fish Creek Reservoir Expansion EIS* (Cedar Creek, 1992b). The registered permittee is the Stratton Sheep Company of Rawlins, Wyoming, who operates one band of sheep (1,000 ewe/lambs), with a season of use between July 16 and September 1 of each year. Grazing, however, is not permitted within 500 feet of Fish Creek Reservoir.

Water from Fish Creek is treated at the Fish Creek Filtration Plant, prior to distribution into the water system. The treatment process entails filtration for the removal of particulates (such as giardia cysts), chemical treatment for corrosion control, and chlorination for disinfection (Peterson, 1992). A schematic of the plant processes is portrayed in Figure 3-8, Fish Creek Filtration Plant Schematic.

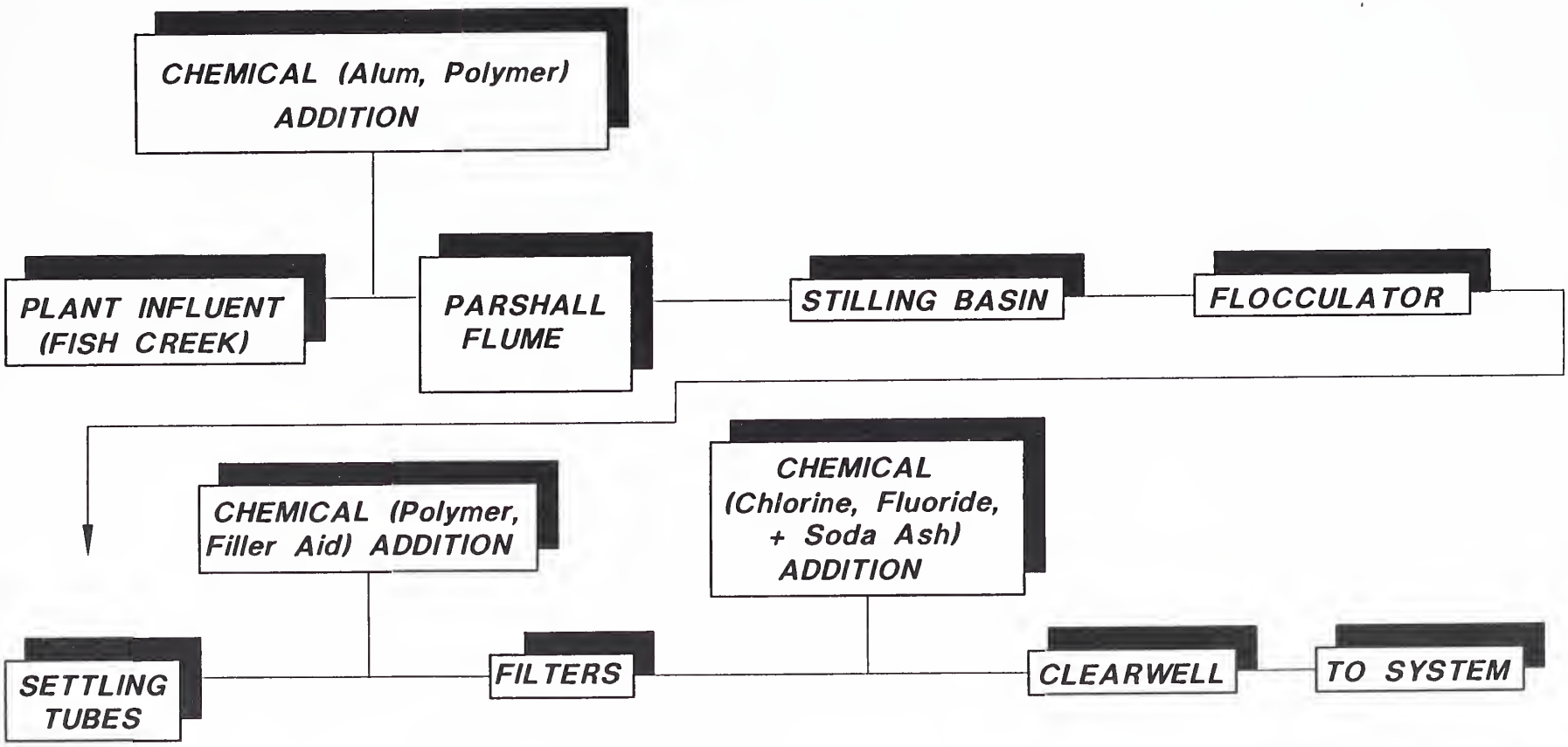
In order to meet the requirements of the *Safe Drinking Water Act* (SDWA), water from the filtration plant is analyzed on an annual basis for several general parameters, inorganics, and regulated metals. The results of these analyses for the past 3 years is presented in Table 3-7, Fish Creek Filtration Plant Water Quality Data. Additional requirements of the SDWA include the analyses of herbicides, pesticides, gross alpha and gross beta radiation, and volatile organic compounds. Recent analyses for these parameters indicate that the treated water is of high quality and meets all of the SDWA requirements.

A recent amendment to the SDWA requires that water from "high-risk" homes be analyzed for lead and copper. "High-risk" homes are those which have lead service lines and/or interior lead pipes, plumbing, or solder. Such homes have been identified in the City and the Mt. Werner district and a testing program has been initiated.

3.3.4.2 Yampa River Infiltration Galleries

In addition to the main water supply provided by Fish Creek, the City and Mt. Werner maintain three infiltration galleries (well fields) to supply water to the community during peak demands. The infiltration galleries also provide redundancy to the water system and a back-up supply for emergency situations (CDC, 1991). The infiltration galleries are fairly shallow (approximately 20 to 30 feet deep) and draw alluvial groundwater from the Yampa basin.

FISH CREEK FILTRATION PLANT SCHEMATIC



Project No.: 828-1500	Design By: J. RAY	Scale: NO SCALE
File: FC3SCH.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-8

FISH CREEK RESERVOIR EIS

FISH CREEK FILTRATION PLANT SCHEMATIC

TABLE 3-7
FISH CREEK FILTRATION PLANT WATER QUALITY DATA

	February 1990 (mg/l)[1]	March 1991 (mg/l)[1]	March 1992 (mg/l)[1]	Drinking Water Standards (mg/l)
Alkalinity (as $CaCO_3$)	28	30	18	
Bicarbonate Alkalinity (as $CaCO_3$)	28	30	18	
Carbonate	0	0	0	
Calcium (Dissolved)	4	4	4	
Corrosivity	-1.1 LI[2]	-2.1 LI	-2.4 LI	
Fluoride	0.91	0.93	1.3	4.0
Nitrate/Nitrite (as N)	0.06	0.07	0.08	
Nitrite (as N)	< 0.01	< 0.01	< .01	
Nitrate (as N)	0.06	0.08	0.08	10.0
pH	7.2 units	6.9 units		
Sodium	11	6	7	
Total Dissolved Solids	30	44	38	500[3]
Arsenic	< 0.001	< 0.001	0.002	0.05
Barium	< 0.01	< 0.01	< 0.01	1.0
Cadmium	0.0001	< 0.0001	< 0.0001	0.01
Chromium	0.01	< 0.01	< 0.01	0.05
Lead	< 0.001	.002	< 0.001	0.05
Mercury	< 0.0001	< 0.0001	< 0.0001	0.002
Selenium	< 0.001	< 0.001	.002	0.01
Silver	< 0.01	< 0.0005	< 0.0005	0.05

[1]-All units in mg/l unless otherwise specified
[2]-LI = Langelier Index
[3]-Secondary Drinking Water Standard

The groundwater in the Yampa basin has a relatively high mineral content and, therefore, is not as high in quality as the Fish Creek water. The infiltration gallery water is generally higher in alkalinity, hardness, and dissolved solids than the Fish Creek source. Additionally, the alluvial groundwater has relatively high concentrations of iron and manganese and has exceeded the secondary drinking water standards for these parameters (CDC, 1991; MWW&SD, 1992). While iron and manganese are not suspected to cause any health concerns, they are known to create aesthetic impacts such as objectionable taste and odor, and staining of fixtures. Several pools in town, including the Steamboat Springs Health and Recreation Association (SSHRA) pool, have experienced water quality problems when the infiltration galleries have been operated. A letter to City Council expressing the concerns of SSHRA is presented in Appendix D. Water quality data for the three infiltration galleries are displayed in Table 3-8, Infiltration Galleries Water Quality Data.

TABLE 3-8
INFILTRATION GALLERIES WATER QUALITY DATA
JUNE 1992

	Well Field A (mg/l)	Well Field G (mg/l)	Well Field H (mg/l)	Secondary Standards (mg/l)
Total Alkalinity (as $CaCO_3$)	132	130	128	
Bicarbonate Alkalinity (as $CaCO_3$)	132	130	128	
Carbonate Alkalinity (as $CaCO_3$)	0	0	0	
Calcium (dissolved)	35	34	30	
Hardness (as $CaCO_3$)	129	126	116	
Magnesium (dissolved)	10	10	10	
Ammonia Nitrogen	<.05	<.05	<.05	
Total Dissolved Solids	176	182	134	500
Total Suspended Solids	<2	<2	<2	
Copper (Total)	.02	.01	.01	1
Iron (Total)	.02	.18	.54	0.3
Manganese (Total)	.40	.05	.46	0.05

Water from the infiltration galleries undergoes minimal treatment, in the form of chlorination and fluoridation (Peterson, 1992). The water is then pumped into the distribution system. If the infiltration galleries were to be expanded, or utilized to a greater extent, additional treatment would likely ensue. Further treatment for the removal of iron and manganese would be necessary. Additionally, it is likely that filtration would be required if particulate analyses revealed that the shallow groundwater source was under the influence of surface conditions (Chubrilo, 1992). Substantial additional treatment, beyond iron and manganese removal and filtration, would be required to produce a water of equal quality to the Fish Creek water.

3.3.5 Water System

3.3.5.1 Study Area

A water service study area has been defined that includes the City of Steamboat Springs, the Mt. Werner Water and Sanitation District, and areas that are likely to be served by either the City or Mt. Werner within the next forty years. The City has recently agreed to provide water to Steamboat II, a subdivision west of Steamboat Springs, presently outside of the city boundaries. Additionally, any water main constructed between the present City limits and Steamboat II, would be sized to serve the intervening area that could be served by gravity. This includes the area between the City and Steamboat II, to an elevation of 6,900 feet (Birch, 1992b). Mt. Werner anticipates that it will eventually expand its service area to include Alpine Land.

Figure 3-9, Water Planning Area, depicts the water planning area. It details the planning area as follows:

- Present Service Area
  - City of Steamboat Springs Service Area (A)
  - Mt. Werner Water and Sanitation District (B)
- Projected 2013 Service Area
  - Steamboat II (C)
  - North Area Between City and Steamboat II (D)
- Projected 2033 Service Area
  - Alpine Land/Potential Southern Service Area (E)
  - South Area Between the City and Steamboat II (F)

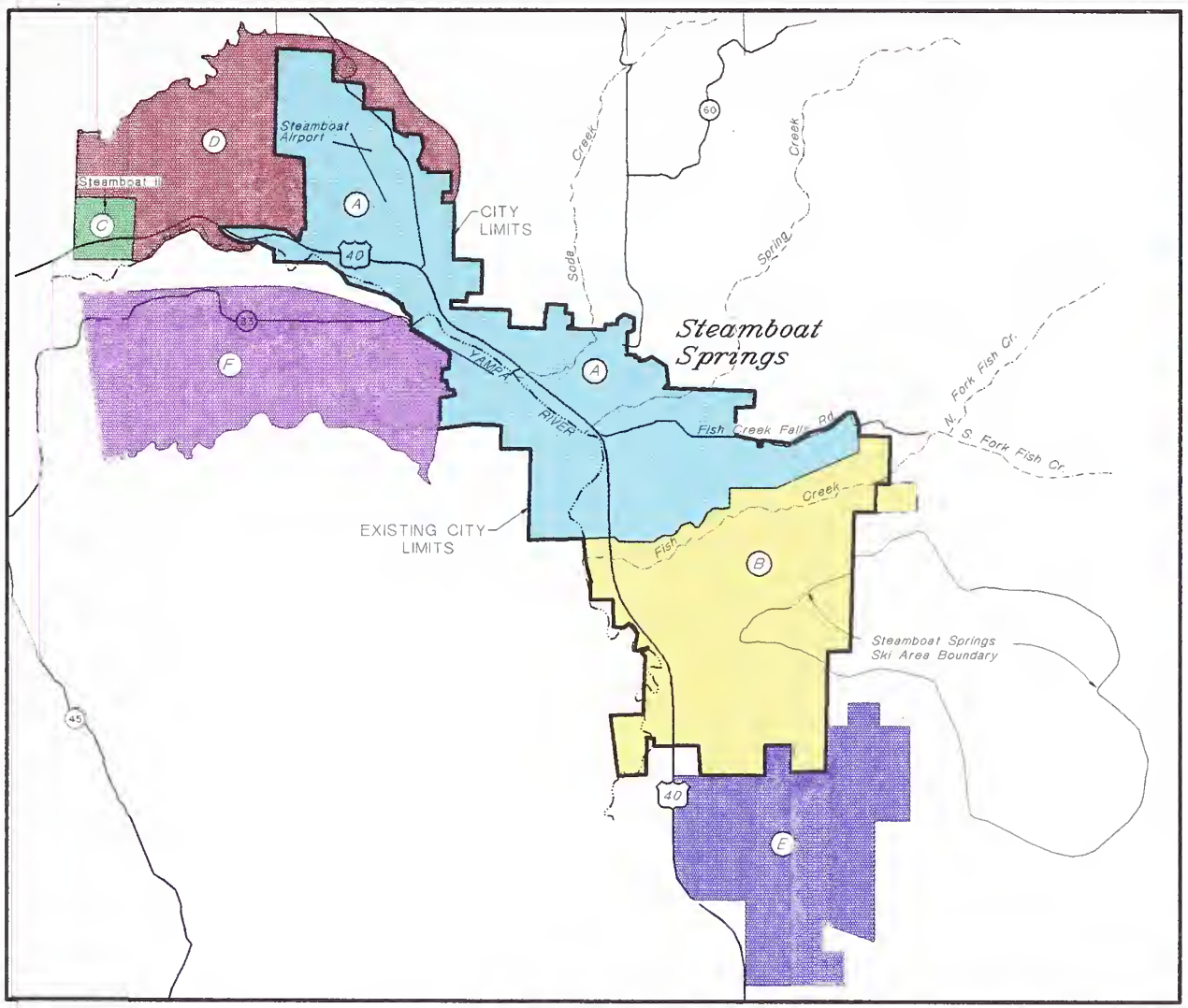
The City believes that providing Steamboat II and the intervening area with treated water is consistent with the community goal of fostering moderate income housing. Water could be provided to this area with or without annexation. The City, however, has indicated that water service could be tied to eventual annexation (Birch, 1992b).

3.3.5.2 Water Providers

The City and Mt. Werner are the major water providers in the service area. The City is a municipal water provider and Mt. Werner is a quasi-municipal subdivision of the State of Colorado under the special district law. It was created in 1967 to provide water and sewer services to the developing ski area. Other minor water providers in the area include Ski Town Campground, Sleepy Bear Mobile Home Park, Treehaus, Steamboat Ski Area, and Whitehaven Mobile Home Park. Riverside has recently been tied into the City water system.

3.3.5.3 Existing Facilities

Following is a summary of the major facilities within the City and Mt. Werner water systems. A further detailed description of these facilities is found in the *Water Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992b). Figure 3-10, Water System Facilities shows the location of the water system facilities.



LEGEND

Service Area Boundaries

- A — CITY OF STEAMBOAT SPRINGS (EXCLUDING MT. WARNER)
- B — MT. WARNER WATER AND SANITATION DISTRICT
- C — STEAMBOAT II
- D — POTENTIAL SERVICE AREA BETWEEN CITY AND STEAMBOAT II - NORTH
- E — ALPINE LAND/POTENTIAL SOUTHERN SERVICE AREA
- F — POTENTIAL SERVICE AREA BETWEEN CITY AND STEAMBOAT II - SOUTH

N

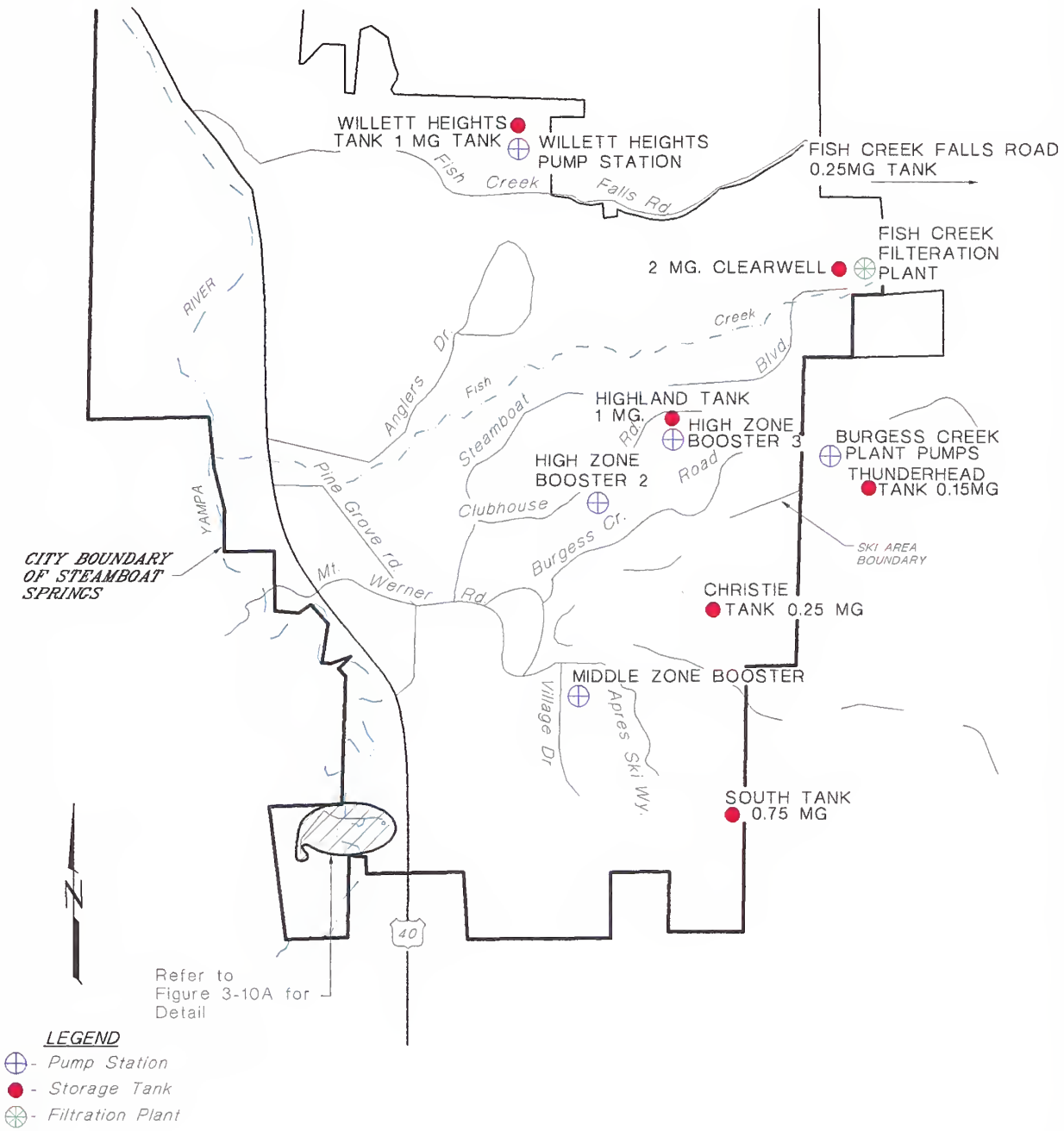
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828-1500	J.RAY	NO SCALE
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FC3PLNA.DWG	T.CLARK	AUGUST 1993

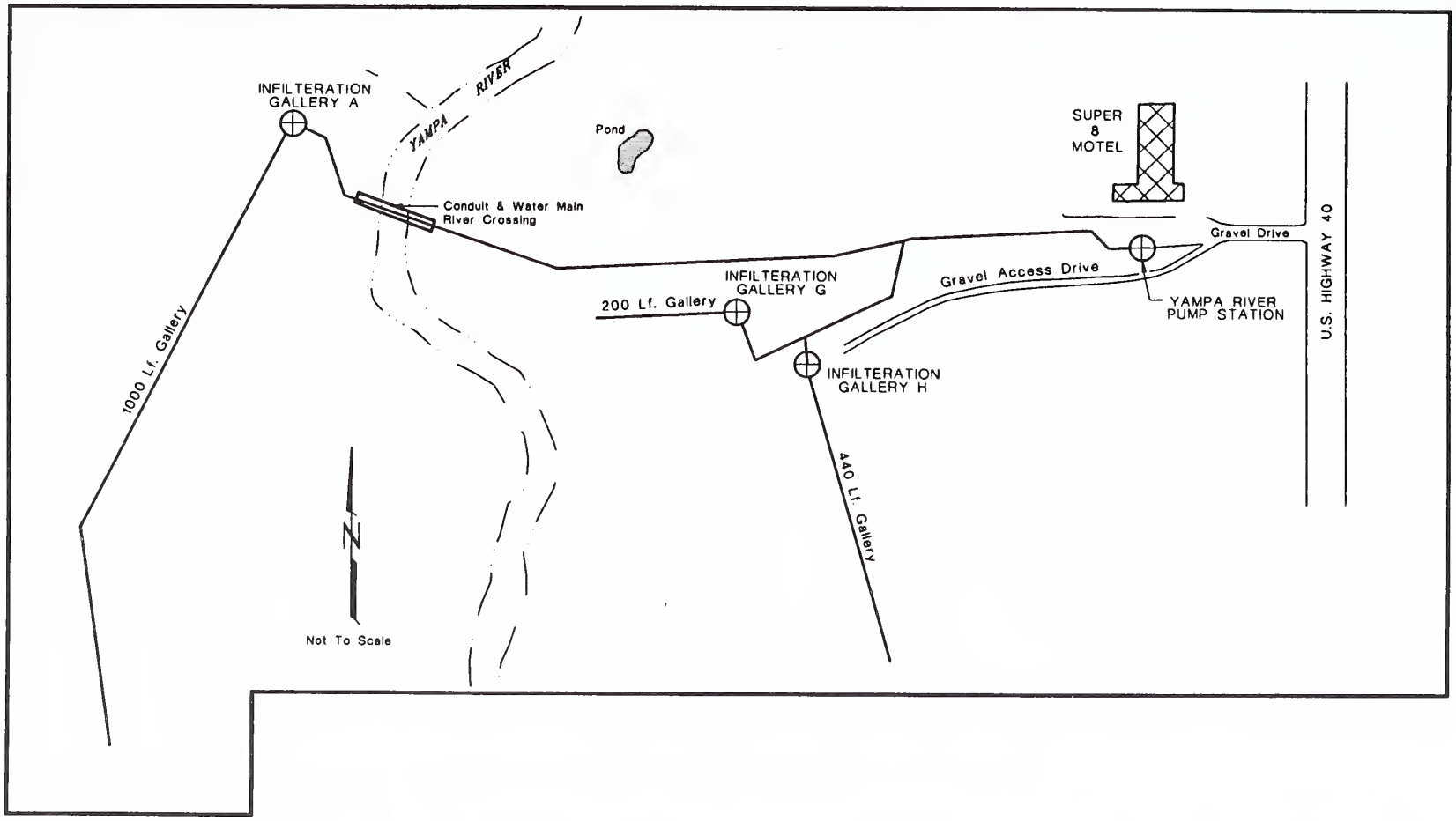
FIGURE 3-9

FISH CREEK RESERVOIR EIS

WATER PLANNING AREA



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File: FC3EXFA.DWG	Drawn By: T. CLARK	Date: August 1993	
FIGURE 3-10			WATER SYSTEM FACILITIES



Project No.: 828-1500	Design By: J. RAY	Scale: NO SCALE
File: FC3INGA.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-10A

FISH CREEK RESERVOIR EIS

WATER SYSTEM FACILITIES
INFILTRATION GALLERIES

The City water system consists of a two-third interest (with Mt. Werner) in the 4.5 million gallon per day (MGD) Fish Creek Water Filtration Plant; the Yampa River infiltration galleries capable of providing approximately one MGD of water; three potable water storage tanks with a total capacity of 3.25 million gallons (MG); one pumping station; and approximately 40 miles of water distribution lines (Birch, 1992c).

Mt. Werner's water system consists of a one-third interest (with the City) in the 4.5 MGD Fish Creek Water Filtration Plant; the Yampa River infiltration galleries, capable of providing approximately one MGD of water; four potable water storage tanks with a combined capacity of 2.15 MG; four pumping stations; and approximately 35 miles of water distribution lines.

3.3.5.4 Water System Operations

Although the City and Mt. Werner maintain separate ownership of the water systems as described in the previous section, it is operated primarily as one system. Table 3-9, Water System Facilities, summarizes the ownership, operation, and maintenance of the water system.

TABLE 3-9
WATER SYSTEM FACILITIES

Facility	Owns	Operates	Maintains
A-DAMS/RESERVOIRS			
Fish Creek Reservoir	C	C	C
Long Lake Reservoir	C	C	C
B-TREATMENT PLANTS			
Fish Creek Filtration Plant	C-2/3 MW-1/3	MW	MW
C-WELL FIELDS			
Well Field A	C	MW	MW
Well Field G	MW	MW	MW
Well Field H	MW	MW	MW
D-DISTRIBUTION SYSTEM			
City	C	C	C
Mt. Werner	MW	MW	MW
E-PUMP STATIONS			
Yampa River Pump Station	MW	MW	MW
Willet Heights	C	MW	MW
All Others	MW	MW	MW
F-STORAGE TANKS			
Fish Creek Filtration Plant	C	MW	MW
Willet Heights	C	MW	MW
Fish Creek Falls	C	MW	MW
All Others	MW	MW	MW
C=City MW=Mt. Werner			

3.3.6 Water Demand

3.3.6.1 Historical Water Usage

Water usage data for the City, Mt. Werner, and the two entities combined, tabulated from 1985 (when the Fish Creek Filtration Plant was placed on line) to the present, is presented in Table 3-10, Water Usage.

Total water usage is shown graphically in Figure 3-11, Total Water Usage. Since 1985, total annual water usage has been approximately 800 million gallons per year (MG/yr) with about one-half of the usage attributed to the City, and one-half of the usage attributed to Mt. Werner. The greatest amount of water is utilized during the irrigation season (May through September), and the least amount of water is generally utilized between the ski and summer seasons (April, May, October, and November). Although the largest numbers of people are in town during the ski season (December through March), water usage is not as high as during the summer irrigation months.

Monthly water usage for 1991 for the City, Mt. Werner, and the two entities combined is shown graphically in Figure 3-12, 1991 Water Usage. While annual usage trends are similar for both the City and Mt. Werner, Mt. Werner tends to utilize more water than the City in the winter months and less water than the City during the summer months. The highest monthly usage for both entities, however, is during the summer months. This data indicates that irrigation impacts water demand to a greater extent than ski season tourism.

Annual water usage, between 1985 and 1991, for the City, Mt. Werner, and the two entities combined is presented in Figure 3-13, Annual Water Usage. While total annual water usage has been about 800 MG/year, since 1988, the annual water usage in Mt. Werner has slightly exceeded the annual usage in the City. This may be due to the fact that more permanent year-round residents have moved into the Mt. Werner district, and subsequently, more summer irrigation is occurring in the Mt. Werner service area. Another trend noted in Figure 3-13 is that the total water usage has slightly declined since 1989. This is likely due to one of several factors:

- Increased awareness in the need for conservation
- Installation of water meters and initiation (in 1993) of metered service and billing rates (community residents are now aware of their water usage patterns and may be gradually initiating their own water conservation methods)
- Higher than average summer precipitation over the past several years.

Based on this past data, and a permanent population of approximately 7,000, a unit water demand of 330 gallons per capita per day (gpcd) is generally utilized in the service area on an annual average basis. With tourist population factored into the analysis, the actual unit demand is approximately 210 gpcd.

TABLE 3-10
WATER USAGE 1985 - 1992
MG

MONTH	1985			1986			1987			1988		
	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL
JAN	30.323	37.329	67.652	29.709	35.828	65.537	29.620	39.795	69.415	27.389	33.296	60.685
FEB	30.411	35.815	66.226	27.501	30.989	58.490	26.430	34.864	61.294	24.695	30.226	54.921
MAR	31.752	39.562	71.314	30.231	37.465	67.696	28.311	40.584	68.895	29.530	33.850	63.380
APR	26.747	25.039	51.786	27.621	24.291	51.912	26.376	25.660	52.036	24.357	20.805	45.162
MAY	31.909	24.336	56.245	37.382	23.513	60.895	30.372	24.773	55.145	31.012	22.581	53.593
JUN	59.473	43.711	103.184	59.525	48.900	108.425	51.519	45.362	96.881	60.303	48.116	108.419
JUL	55.342	46.486	101.828	39.972	41.957	81.929	54.146	42.270	96.416	68.354	56.031	124.385
AUG	47.575	47.157	94.732	52.374	47.864	100.238	38.738	31.937	70.675	53.309	50.849	104.158
SEP	32.789	27.685	60.474	30.868	26.987	57.855	36.857	25.770	62.627	37.554	37.342	74.896
OCT	26.628	20.738	47.366	27.119	21.654	48.773	26.685	20.000	46.685	25.562	24.804	50.366
NOV	28.829	20.766	49.595	25.259	22.927	48.186	24.374	18.219	42.593	23.074	24.773	47.847
DEC	30.775	33.027	63.802	28.152	33.702	61.854	27.187	27.382	54.569	24.723	33.122	57.845
ANNUAL TOTAL	432.553	401.651	834.204	415.713	396.078	811.791	400.615	376.616	777.231	429.862	415.794	845.656

TABLE 3-10 (cont'd)
WATER USAGE 1985 - 1992
MG

MONTH	1989			1990			1991			1992		
	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL	CITY	MT. WERNER	TOTAL
JAN	23.566	38.027	61.593	26.334	38.885	65.219	25.511	39.981	65.489	25.603	36.879	62.482
FEB	30.275	36.802	60.077	23.862	34.472	58.334	22.994	35.944	58.938	23.501	32.914	56.415
MAR	26.328	41.279	67.607	25.589	39.524	65.113	25.437	37.962	63.399	24.038	37.861	61.899
APR	24.521	25.856	50.377	20.829	22.658	43.487	22.248	25.503	47.751	22.619	23.367	45.986
MAY	34.874	31.227	66.101	26.563	25.286	51.849	21.998	21.992	43.990	30.404	26.754	57.158
JUNE	54.832	49.263	104.095	47.972	45.236	93.208	42.890	40.486	83.376	38.889	31.229	70.118
JUL	63.758	59.920	123.678	46.265	51.636	97.901	52.639	55.774	108.413	44.387	36.879	84.210
AUG	40.693	44.605	85.298	49.037	54.174	103.211	44.864	39.981	84.845	41.698	45.477	87.175
SEP	37.128	35.763	72.891	34.810	34.310	69.120	34.555	31.230	65.785	27.148	29.304	56.452
OCT	26.765	26.550	53.315	32.103	26.862	58.965	26.822	20.779	47.601	24.637	22.954	47.591
NOV	23.905	25.406	49.311	25.871	26.113	51.984	23.158	18.533	41.691	21.290	23.285	44.575
DEC	27.279	33.097	60.376	27.482	33.254	60.736	27.572	27.993	55.565	23.253	29.820	53.073
ANNUAL TOTAL	406.924	447.795	854.719	386.717	432.410	819.127	370.688	396.155	766.843	347.467	379.667	727.134

3.3.6.2 Water Demand Projections

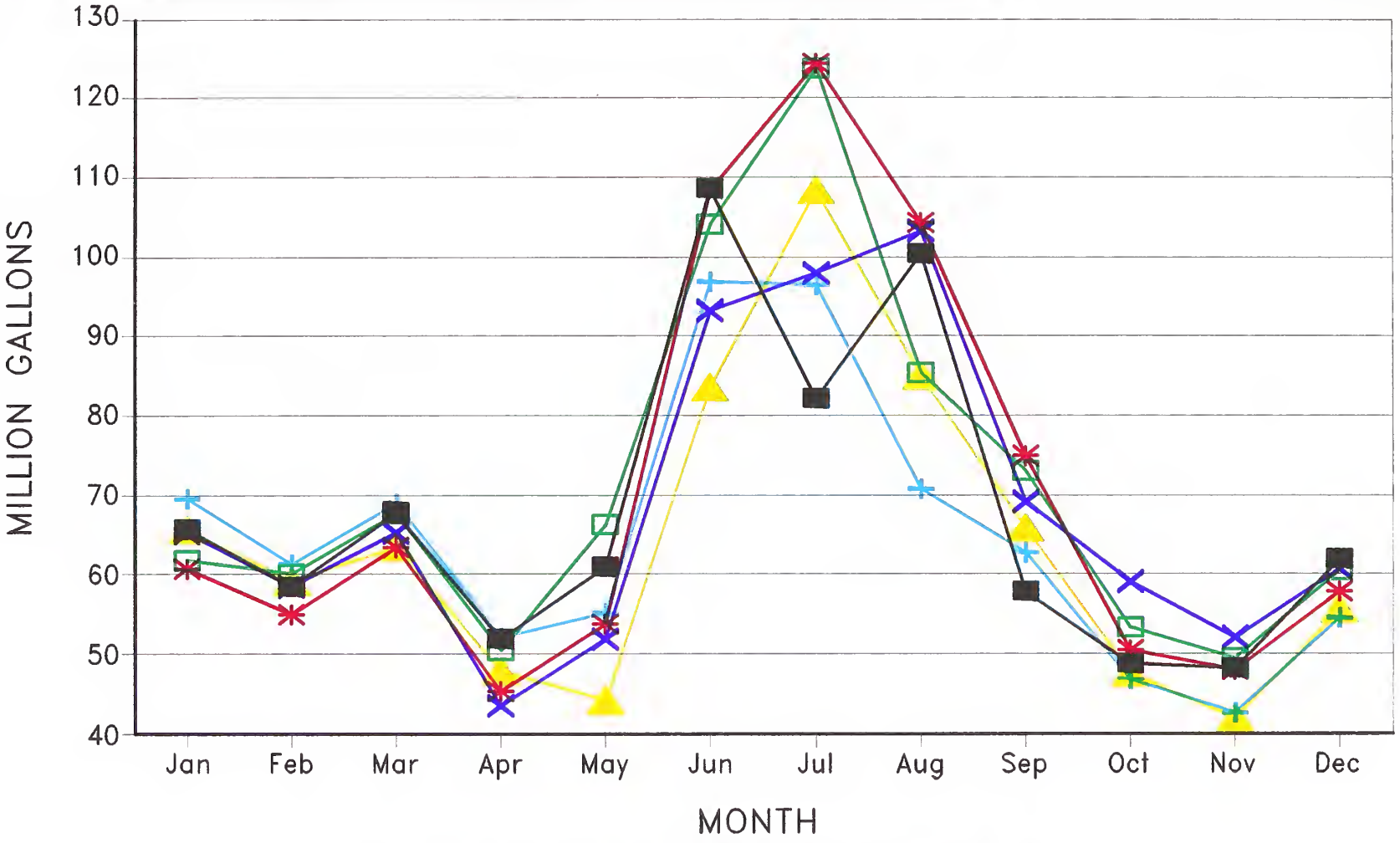
For this analysis, future annual water demands are calculated using permanent population projections and a permanent population unit water demand of 330 gpcd. This method (utilizing the permanent population) is considered appropriate for this analysis, since available data is more accurate for permanent population than it is for tourist population. To account for fluctuations in flow due to tourism and seasonal usage patterns, monthly estimates are presented in Section 3.3.6.3 based on historical monthly usage patterns.

Population projections, utilizing three growth scenarios, are presented in Table 3-11, Steamboat Springs Population and Population Projections and shown graphically in Figure 3-14, Population Projections. The low growth scenario corresponds to an annual growth rate of 1.6 percent; the moderate growth scenario corresponds to an annual growth rate of 3.2 percent; and the high growth scenario assumes a 7-8 percent growth rate over the next ten years (corresponding to infill in Steamboat Springs due to the potential development at Lake Catamount), followed by a 3.2 percent growth rate to the year 2033. These 40-year projections are based upon extrapolation of the city's 20-year projections discussed in Section 3.4.4 (Birch, 1993). The moderate growth rate has been selected by the City for planning purposes, and will be utilized throughout this analysis (Birch, 1993).

TABLE 3-11
STEAMBOAT SPRINGS POPULATION AND POPULATION PROJECTIONS

Year	Low Growth Scenario	Moderate Growth Scenario	High Growth Scenario
1970	2,340	2,340	2,340
1980	5,098	5,098	5,098
1989	6,213	6,213	6,213
1989	6,491	6,491	6,491
1990	6,695	6,695	6,695
1995	7,037	7,609	9,694
2000	7,618	8,907	11,960
2005	8,247	10,426	14,175
2010	8,928	12,242	16,665
2015	9,665	14,330	19,508
2020	10,464	16,774	22,835
2025	11,328	19,636	6,730
2030	12,264	22,985	31,290
2033	12,862	25,263	34,391

Utilizing the moderate growth rate population projections and a water demand of 330 gpcd, the total (City and Mt. Werner) annual water demand is projected to be 2,641 AF in 1993, 4,970 AF in the year 2013 and 9,330 AF in the year 2033. Annual water demand projections are shown graphically in Figure 3-15, Water Demand Projections.

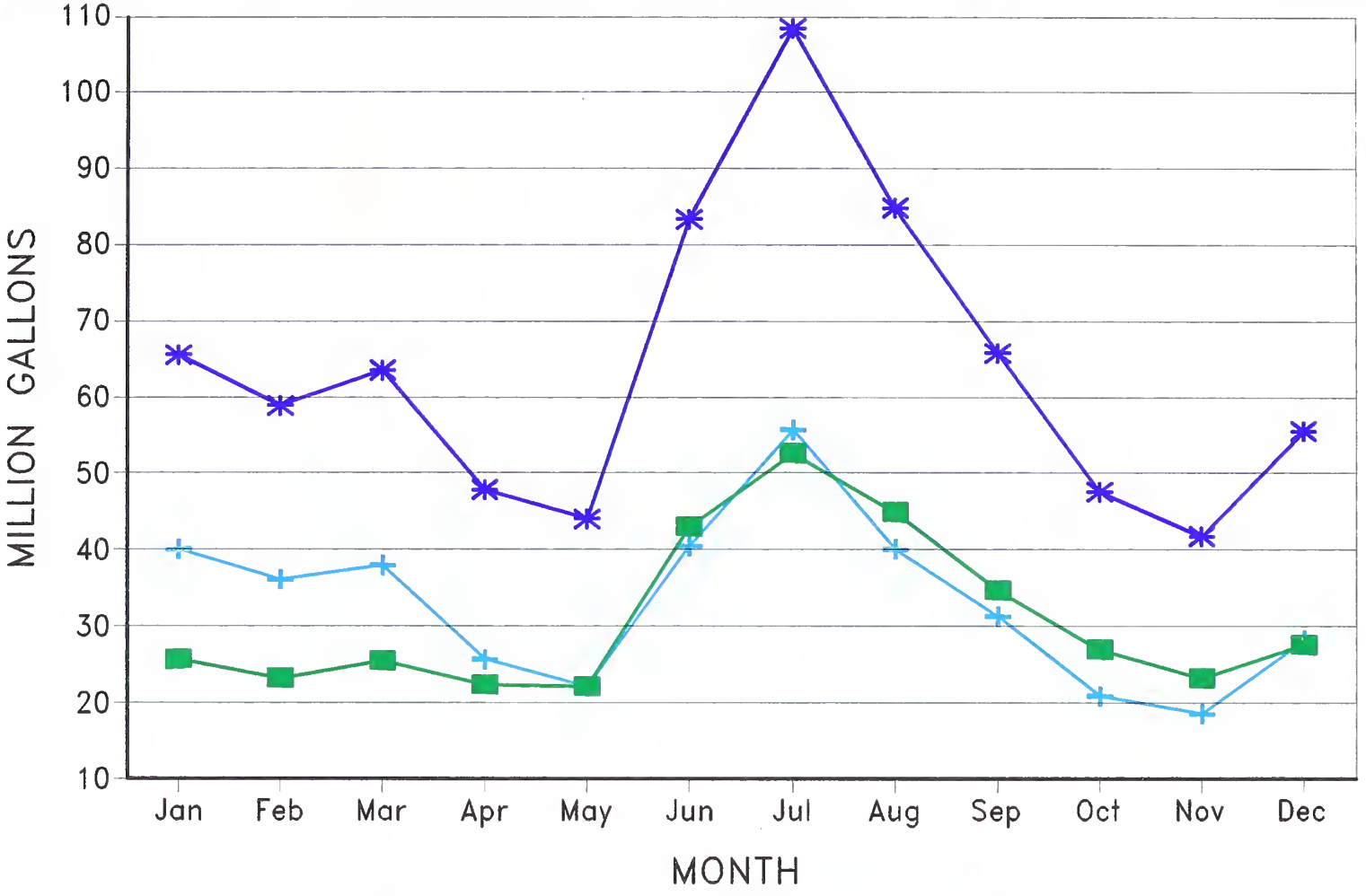


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File: FC3TWU.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-11

FISH CREEK RESERVOIR EIS

TOTAL WATER USAGE (CITY AND MT. WERNER)



LEGEND

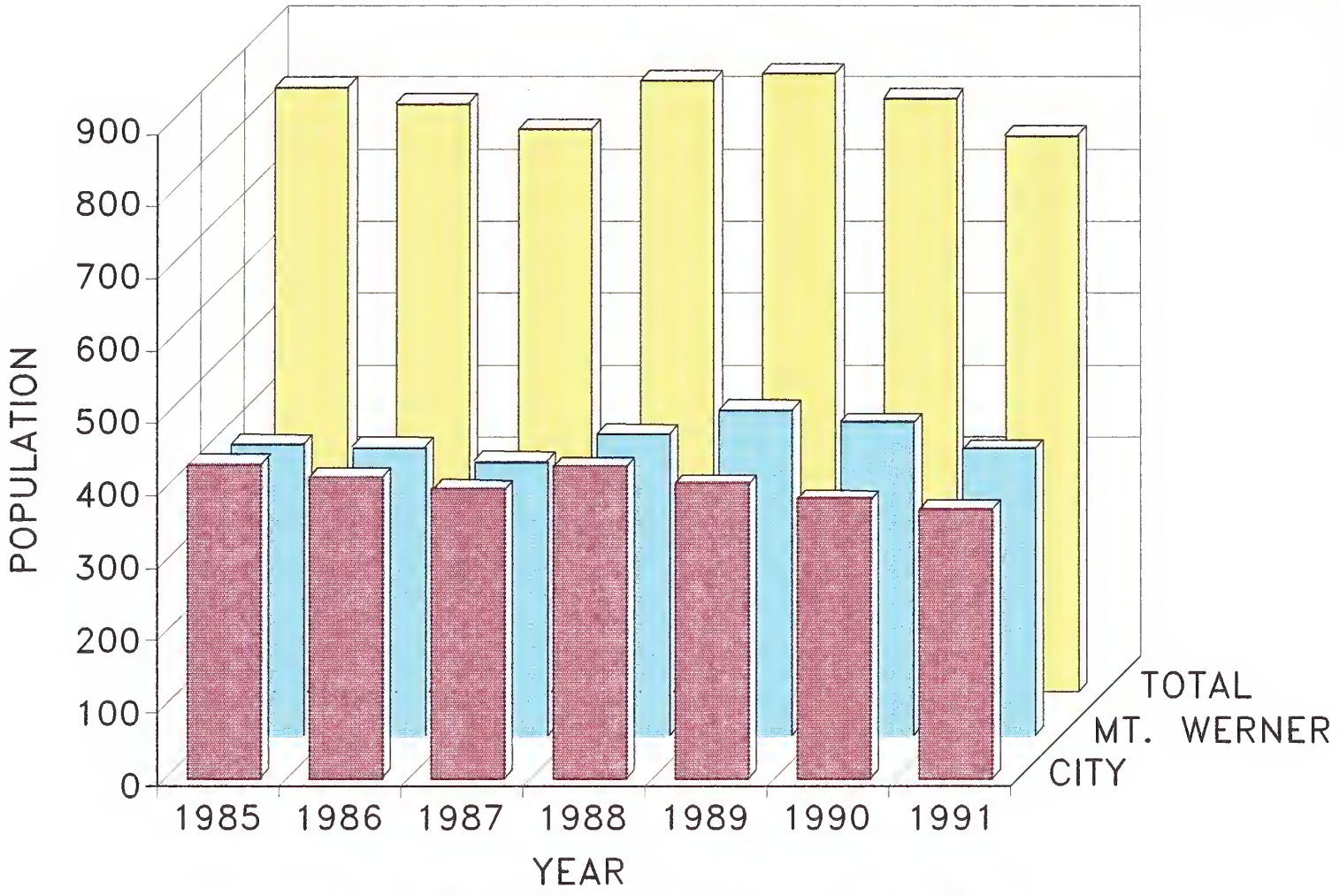
- CITY
- MT. WERNER
- TOTAL

Project No.: 828-1500	Design By: J. RAY	Scale: NO SCALE
File: FC31991.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-12

FISH CREEK RESERVOIR EIS

1991 WATER USAGE CITY, MT. WERNER AND TOTAL

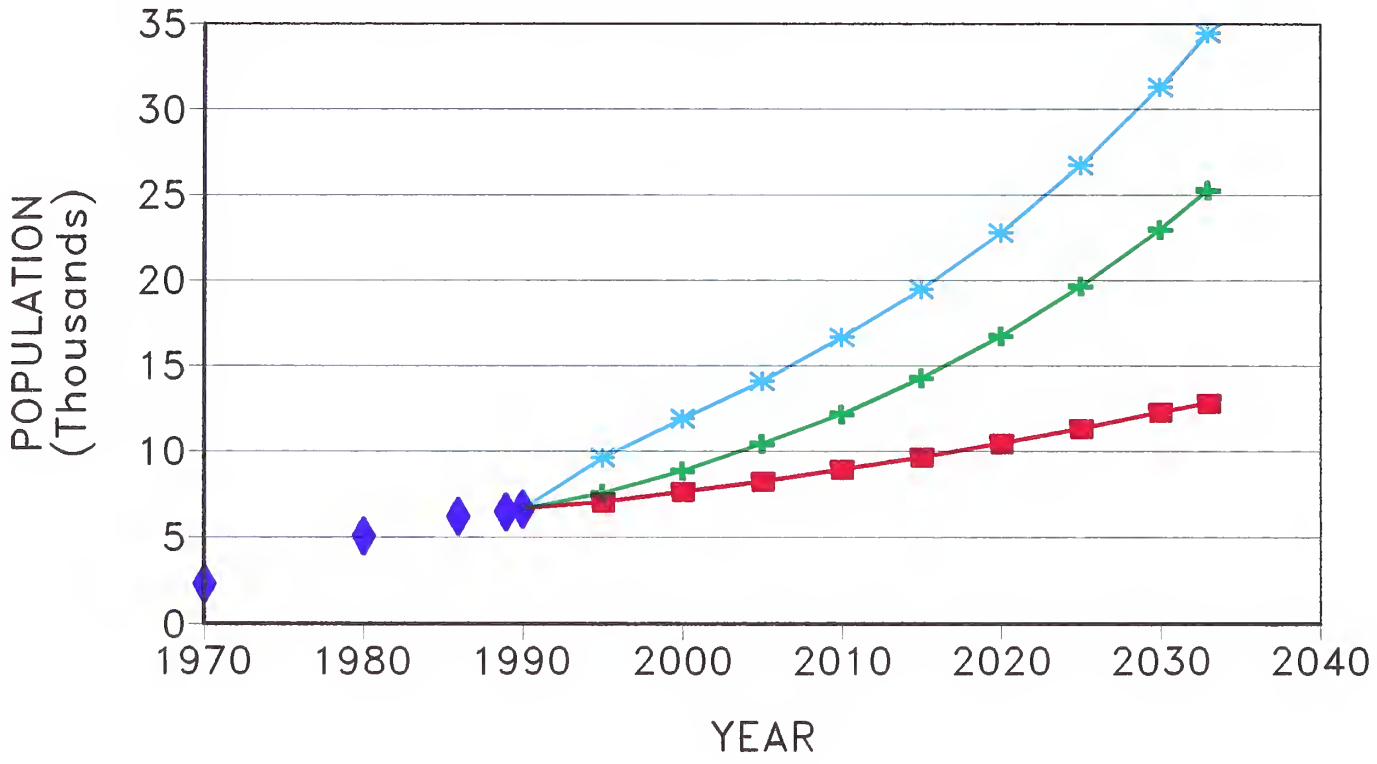


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File: FC3ANWU.DWG	Drawn By: T. CLARK	Date: AUGUST 1993

FIGURE 3-13

FISH CREEK RESERVOIR EIS

ANNUAL WATER USAGE
1985 - 1991



LEGEND

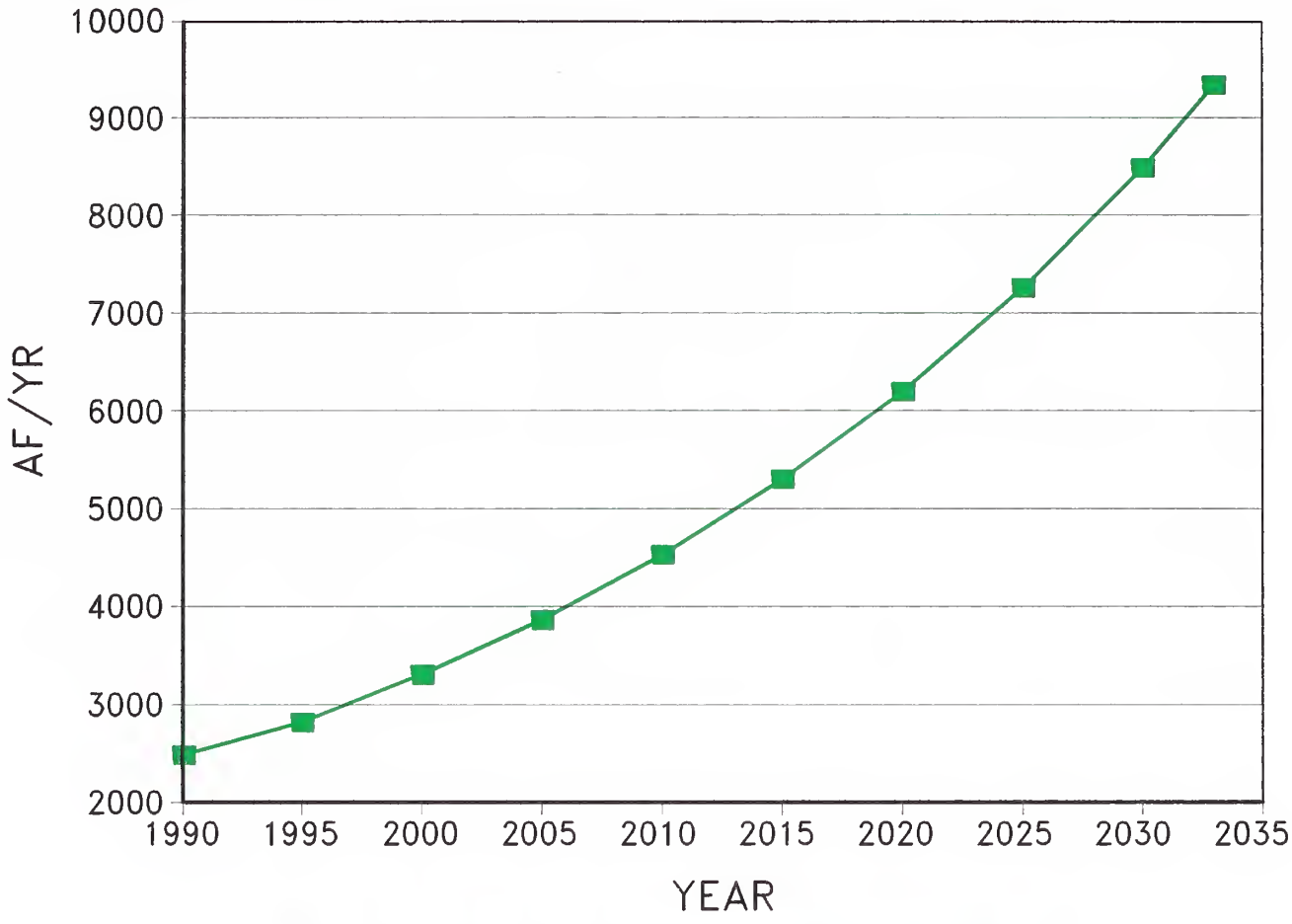
- HISTORICAL GROWTH
- LOW GROWTH
- MODERATE GROWTH
- HIGH GROWTH

Project No.: 828-1500	Design By: J.RAY	Scale: NO SCALE
File: FC3PPT.DWG	Drawn By: T.CLARK	Date: AUGUST 1993

FIGURE 3-14

FISH CREEK RESERVOIR EIS

POPULATION PROJECTIONS



Project No.: 828-1600	Design By: J.RAY	Scale: NO SCALE
File: FC3WDP.DWG	Drawn By: T.CLARK	Date: AUGUST 1993

FIGURE 3-15

FISH CREEK RESERVOIR EIS

WATER DEMAND PROJECTIONS

3.3.6.3 Monthly Water Demand Projections

Monthly water demand projections are based upon actual water usage patterns demonstrated by the City and Mt. Werner between 1985 and 1992 (see Table 3-10).

Average monthly usage over this seven-year period and the percent of the annual usage is presented in Table 3-12, for the City, Mt. Werner, and the two entities combined. The monthly percentage of the total annual demand is also shown graphically in Figure 3-16, Percent of Annual Demand.

TABLE 3-12
MONTHLY WATER DEMANDS*

MONTH	CITY		MT. WERNER		TOTAL COMBINED	
	AF	Percent Total	AF	Percent Total	AF	Percent Total
JAN	85	6.8	115	9.2	200	8.0
FEB	79	6.3	104	8.3	183	7.3
MAR	86	6.9	118	9.4	204	8.2
APR	76	6.1	74	5.9	150	6.0
MAY	94	7.5	76	6.1	170	6.8
JUN	168	13.2	140	11.2	305	12.2
JUL	168	13.4	155	12.4	323	12.9
AUG	144	11.5	138	11.0	282	11.3
SEP	108	8.6	95	7.6	203	8.1
OCT	84	6.8	70	5.6	154	6.2
NOV	76	6.1	69	5.5	145	5.8
DEC	85	6.8	96	7.7	181	7.3
TOTAL	1,250		1,250		2,500	

* Based on 7 Year Average (1985-1992)

Future monthly demands were determined by taking the future annual demands (see Section 3.3.6.2) and applying the monthly percentage of the total annual demand. Monthly water demands for the years 1993, 2013, and 2033, using the moderate growth projections, are shown in Table 3-13 for the City, Mt. Werner, and the two entities combined. These monthly water demand projections assume that future water usage patterns will simulate historical patterns.

TABLE 3-13
FUTURE MONTHLY WATER DEMANDS (AF)

MONTH	CITY				MT. WERNER				TOTAL COMBINED			
	%	1993	2013	2033	%	1993	2013	2033	%	1993	2013	2033
JAN	6.8	90	169	318	9.2	121	229	430	8	211	398	748
FEB	6.3	83	157	294	8.3	110	206	388	7.3	193	363	682
MAR	6.9	81	172	322	9.4	124	234	439	8.2	215	406	761
APR	6.1	81	152	285	5.9	78	147	276	6	159	299	561
MAY	7.5	99	187	350	6.1	81	152	285	6.8	180	339	635
JUN	13.2	174	327	615	11.2	149	279	521	12.2	323	606	1,136
JUL	13.4	177	333	626	12.4	164	306	579	12.9	341	641	1,205
AUG	11.5	152	286	537	11	145	274	514	11.3	297	560	1,051
SEP	8.6	114	214	402	7.6	100	189	355	8.1	214	403	757
OCT	6.7	88	167	313	5.6	78	139	261	6.2	162	306	574
NOV	6.1	81	152	285	5.5	73	137	257	5.8	154	289	542
DEC	6.8	90	169	318	7.7	102	191	360	7.3	192	360	678
TOTAL		1,320	2,485	4,665		1,321	2,485	4,665		2,641	4,970	9,330

3.3.7 Reservoir Storage Requirements

The need for reservoir storage of water is determined by comparing the available water supply during a low flow year with the water demand of the service area. Since the supply and demand fluctuate throughout the year, this analysis is done on a monthly basis.

The water supply available during a low flow year is a function of, not only projected low flows, but also of water rights. The City has a 25 percent share and Mt. Werner a 63 percent share of the senior 8.3 cfs direct flow right on Fish Creek. Since the flow in Fish Creek often drops below 8.3 cfs, the City has the right to 25 percent and Mt. Werner to 63 percent of the available flow at the time. The Fish Creek flow available to the City, Mt. Werner, and the two entities combined during a projected low flow year (Hydrosphere, 1993) is presented in Table 3-14, Available Fish Creek Flow.

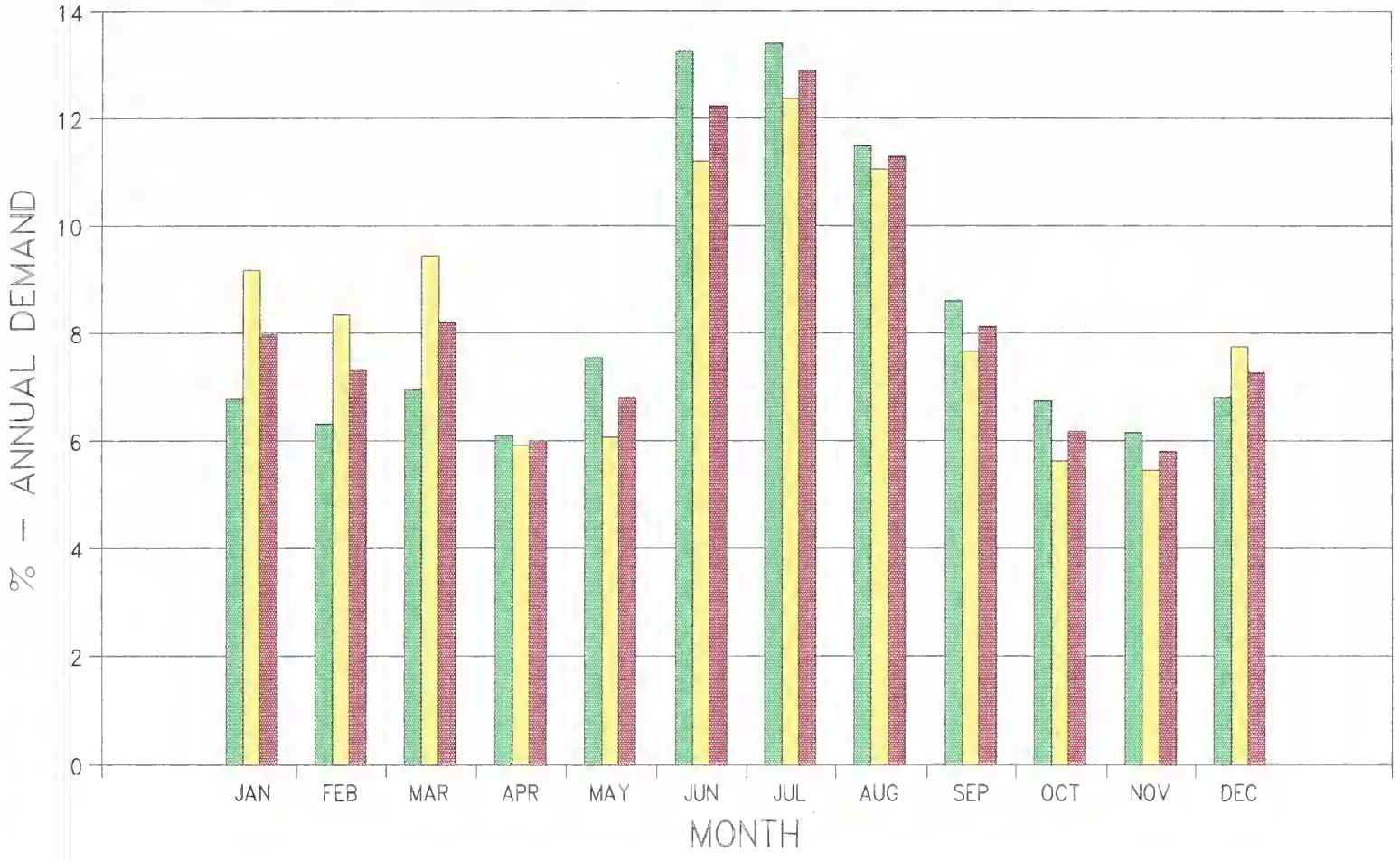
TABLE 3-14
AVAILABLE FISH CREEK FLOW
(AF)

Month	City	Mt. Werner	Total Combined
JAN	46	116	162
FEB	42	105	147
MAR	169	426	595
APR	878	2,211	3,089
MAY	3,643	9,181	12,824
JUN	2,291	5,773	8,064
JUL	200	503	703
AUG	123	310	433
SEP	105	262	367
OCT	31	77	108
NOV	45	112	162
DEC	46	116	162

Water demands presented in Table 3-13 were subtracted from the available Fish Creek flow presented in Table 3-14 to determine the storage volume required by the City, Mt. Werner, and the two entities combined to meet the projected water demands. Results are summarized in Table 3-15, Reservoir Storage Capacity Requirements To Meet Water Demands.

Additional reservoir storage capacity is required beyond that needed to meet the City's and Mt. Werner's projected water demands. A buffer of approximately 25 percent is required to allow for operational flexibility and the immediate response to changes in demand. The City presently releases water quantities from storage greatly in excess of demands due to the lack of a remote operational control system. Even with the ability to control water release remotely from the reservoir, a sufficient buffer will be required.

Additionally, some storage is required to account for inefficiencies in water delivery from the reservoir to the water filtration plant intake. A 10 percent water loss can be assumed between the reservoir and the intake (Holt, 1992c).



Project No.: 828-1600	Design By: J.RAY	Scale: NO SCALE
File: FC3CDM.DWG	Drawn By: T.CLARK	Date: AUGUST 1993

FIGURE 3-16

FISH CREEK RESERVOIR EIS

PERCENT OF ANNUAL DEMAND

TABLE 3-15
RESERVOIR STORAGE CAPACITY REQUIREMENTS TO MEET WATER DEMANDS**
(AF)

Month	CITY			MT. WERNER			TOTAL COMBINED*		
	1993	2013	2033	1993	2013	2033	1993	2013	2033
JAN	44	123	272	5	113	314	44	236	586
FEB	44	115	252	5	101	284	46	213	535
MAR		3	153			13			166
APR									
MAY									
JUN									
JUL		133	426			76			502
AUG	29	163	414			204		127	618
SEP	9	109	297			93		36	390
OCT	57	136	252		62	184	54	198	466
NOV	46	107	240		25	145		132	385
DEC	44	123	272		75	204	30	198	516
TOTAL	260	1,012	2,608	10	376	1,556	179	1,143	4,164

* The total combined storage requirements are equal to the sum of the City and Mt. Werner storage requirements only during those months when both the City and Mt. Werner require storage. During those months when only the City requires storage, if the two entities consolidate, the City can utilize excess Mt. Werner Fish Creek flow prior to utilizing storage capacity.

** Calculated by subtracting water demands (Table 3-13) from direct flow supplied by Fish Creek (Table 3-14)

Furthermore, as discussed previously, the City has agreed to release at least 200 AF annually to maintain minimum in-stream flows in the lower segment of Fish Creek.

A fisheries pool of 1,030 AF, is also included in the total storage volume. This volume is the minimum pool requirement necessary to maintain a fishery in Fish Creek Reservoir.

Total reservoir storage capacity requirements are obtained by adding these additional storage requirements to the values presented in Table 3-15. Table 3-16, Total Reservoir Storage Capacity Requirements, reflect these results.

Additionally, Table 3-16 is further adjusted, assuming both a 10% and 20% decrease in water demand resulting from conservation efforts.

3.3.7.1 City

The City is presently using approximately 350 AF of reservoir storage capacity to meet its water demands (ACZ, 1992b). To meet the future projected demands for the year 2013, as shown in Table 3-16, a total of 1,826 AF of storage would be required. To meet projected 2033 water demands, a total storage volume of 3,981 AF would be required.

Since the City already has approximately 2,238 AF of storage (including 1,842 AF in Fish Creek Reservoir and 396 AF in Long Lake), it does not need additional reservoir storage capacity to meet present demands. Additional storage capacity would be required, however, to meet long-range water demands.

TABLE 3-16
TOTAL RESERVOIR STORAGE CAPACITY REQUIREMENTS[1] (AF)

	CITY		MT. WERNER		TOTAL (OPERATING SEPARATELY)		TOTAL COMBINED[2] (CONSOLIDATED)	
	2013	2033	2013	2033	2013	2033	2013	2033
DEMAND	1,012	2,608	376	1,556	1,388	4,164	1,143	4,164
25% BUFFER	253	652	94	389	347	1,041	286	1,041
10% LOSS	101	261	38	156	139	416	114	416
CWCB FLOW	260	200			200	200	200	200
FISHERIES POOL	260	260	770	770	1,030	1,030	1,030	1,030
TOTAL	1,826	3,981	1,278	2,871	3,104	6,851	2,773	6,851
-10% CONSERVATION SAVINGS[3]	248	466	248	466	497	933	497	933
TOTAL	1,578	3,515	1,030	2,405	2,607	5,918	2,276	5,918
-20% CONSERVATION SAVINGS[4]	496	932	496	932	994	1,866	994	1,866
TOTAL	1,330	3,049	782	1,939	2,110	4,985	1,779	4,985

[1] Adjusted for operational constraints and to meet minimum in-stream flows in lower Fish Creek
[2] The total combined reservoir storage capacity does not equal the sum of the City and Mt. Werner storage requirements for the consolidated district. If the two entities consolidate, the City can utilize excess Mt. Werner stream flow prior to utilizing storage capacity.
[3] Assumes 10% conservation savings
[4] Assumes 20% conservation savings

Even with a successful conservation program resulting in a 20% reduction in water demand, the City would need additional storage capacity to meet projected long-range demands.

In addition, the City has a back-up water supply source in the infiltration galleries (Well Field A). Well Field A, with a sustained yield of approximately 900 gpm, could be utilized to offset peak demands.

3.3.7.2 Mt. Werner

Mt. Werner is presently using approximately 15 AF of the City's reservoir storage capacity to meet its water demands (ACZ, 1992b). It needs 1,278 AF of storage to meet 2013 projected demands and 2,871 AF of storage to meet 2033 projected demands. Since Mt. Werner does not presently have any water storage volume, it must develop storage to meet present and future demands.

Through effective conservation efforts, and a reduction in water demand of 20%, Mt. Werner could reduce its required storage to 782 AF to meet 2013 water demands and 1939 AF to meet 2033 water demands.

Mt. Werner also has a back-up water supply source in the infiltration galleries (Well Fields G and H). The sustained yield of these well fields is approximately 800 gpm.

3.3.7.3 Total Combined Storage Requirements

If the City and Mt. Werner choose to consolidate 2,773 AF of storage would be required to meet 2013 projected demands and 6,851 AF would be needed to meet 2033 demands. Although the City already has 2,238 AF of reservoir storage capacity, additional storage would be required if the two entities consolidate.

Assuming a reduction in water demand of 20% through conservation, required storage volume could be reduced to 1,779 AF to meet 2013 demands and 4,985 AF to meet 2033 demands.

Additionally, the infiltration galleries (Well Fields A, G, and H) would provide a back-up water supply with a sustained yield of approximately 1500 gpm to the consolidated water provider.

3.3.8 Other Water Users

Due to the lack of remote operational control of the Fish Creek Reservoir outlet valve, the City releases substantially more water from storage than is required to meet its own demand. The additional storage water released is intended to augment in-stream flows and maintain the Colorado Water Conservation Board's 2 cfs minimum in-stream flow right (see Section 3.3.3). This water, however, is sometimes utilized during the low flow months of August and September by less senior downstream users.

A recent analysis by the Colorado Division of Water Resources (Holt, 1992d) indicates that released storage has been diverted by several users including:

- Hoyle & Knight Ditch
- Sheraton Golf Course
- Albert A. Mann Ditch
- Alma Baer Ditch

It is estimated that total usage may be as high as 100 AF per month during low flow periods.

More water has historically been released from Fish Creek Reservoir and Long Lake than is necessary to meet the demands of the City. As discussed previously, approximately 15 AF of storage water is utilized annually by Mt. Werner. Water used by downstream diverters and increased in-stream flows account for the additional storage water released.

3.3.9 Water Conservation Programs

Mt. Werner and the City have instituted water conservation plans. Both districts are presently involved in various programs aimed at conserving water, as discussed below.

3.3.9.1 City of Steamboat Springs

The City is considering or is in the process of implementing the following conservation measures.

Metering/Rate Structuring - In order to delay the need to increase the capacity of treatment facilities and in accordance with Colorado's Water Metering Act of 1990, the installation of water meters in both the residential and commercial sectors of the City was completed in 1990, and meter based billing has been initiated. City Council has just recently adopted a rate structure to be applied to actual water usage throughout the City. Metering rates are included in Appendix H.

System Maintenance - The City has recently begun replacing all of its main water lines. The program, which began five years ago, involves the replacement of approximately 40 miles of water pipes over a 30-year period. It is estimated that the entire system will be replaced by the year 2020. Although the City has no formal leak detection program included with the maintenance being done, the replacement of the water lines will reduce leakage, and the installation of meters will increase the City's ability to determine the amount of water being lost to leaks.

Irrigation Restrictions - Lawn watering is restricted between the hours of 10:00 AM and 5:00 PM, but compliance is strictly voluntary as no enforcement of this regulation exists. The *Steamboat Today* publishes irrigation requirements according to local precipitation patterns, and prescribes different homes to water on different days (according to address). Again, compliance with these guidelines is voluntary.

Raw Water Use - Raw, untreated water is currently taken from the Yampa River and used for snow-making at the Howelsen Hill Ski Area. The use of raw water, although not necessarily a conservation technique, helps to reduce the demand for potable water and thus results in treatment cost savings.

Xeriscape Grant - The City of Steamboat Springs has received a $19,000 grant from the Colorado State Office of Water Conservation (COWC) in order to partially fund the design and construction of a high-altitude, xeriscape demonstration at Howelsen Hill Park. Intended to introduce the community to the idea of xeriscaping, the demonstration will compare the water use, maintenance, and visual appearance of a 'xeriscape' to that of a 'normal' landscape. In addition, a guide to water efficient landscapes in Colorado mountain communities will be developed. The demonstration is planned for the summer of 1993.

Plumbing Retrofit Grant - The City of Steamboat Springs has been selected as the test site for a study on the cost effectiveness of retrofitting tourist-oriented lodging complexes. The study will be conducted by the Northwest Colorado Council of Governments and will be funded by a $20,425 grant issued by the COWC. The study will analyze the water use patterns of tourists and will compare the water demand in retrofitted condominiums to demand in non-retrofitted condominiums. From the data obtained, the cost effectiveness of retrofitting large condominiums, including the potential savings that can result, will be determined. The findings of this study will be made available to all resort communities.

Pressure Reduction Valves - The City requires the use of pressure reducing valves (PRVs) in order to ensure that the water pressure in its system does not exceed 60 pounds per square inch (psi). PRVs are installed, not only on main lines, but at each point of use in the system. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system. Water pressure has direct effects on the flow rates of common plumbing fixtures and should thus be maintained at 50-60 psi for maximum efficiency.

3.3.9.2 Mt. Werner Water and Sanitation District

Mt. Werner is implementing the following conservation measures:

Metering/Rate Structuring - The installation of water meters in the residential and commercial sectors of the district was completed in 1991, and meter-based billing began in January 1993. Consumers are charged a base rate that includes a service charge and receive 10 cubic meters (2,640 gallons) of water per month with the base rate. Water usage above this monthly allotment is billed

on a per cubic meter basis. This rate structure is used for both residential and commercial consumers. Metering rates are included in Appendix H.

Lawn Irrigation - Like the City, lawn watering in Mt. Werner is restricted between 10:00 AM and 5:00 PM and information on efficient irrigation is provided in the *Steamboat Today.*

New Construction Ordinance - According to Mt. Werner, its Rules and Regulations (April 1991) require all new buildings constructed in the Mt. Werner Water District to have water-efficient plumbing fixtures. These include low flow toilets, low flow showerheads, and faucet aerators.

Pressure Reduction Valves - Mt. Werner also requires the use of pressure reducing valves (PRVs) in order to ensure that the water pressure in its system does not exceed 60 pounds per square inch (psi). PRVs are installed, not only on main lines, but at each point of use in the system. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system.

Raw Water Use - Like the City, Mt. Werner promotes the use of raw water, in some circumstances, to reduce demand for treated water. The Steamboat Ski Area uses water from the Yampa River to make snow and the Sheraton Golf Course uses water from Fish Creek for irrigation.

Plumbing Retrofit Grant - The Mt. Werner Water and Sanitation District is assisting the City of Steamboat Springs with the study on the cost effectiveness of retrofitting condominiums with low flow devices.

3.4 SOCIOECONOMICS

3.4.1 Introduction

This section addresses the socioeconomic climate which may be affected by the Proposed Action and/or the alternatives to the Proposed Action. It discusses the social atmosphere of the community, general social concerns, demographics, the general relationship between water availability and community growth, and water utility financing. Further details on the socioeconomic resource are found in the *Socioeconomics Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992c).

3.4.2 Social Atmosphere

The social atmosphere in Steamboat Springs is rooted in its ranching and agricultural heritage. The current small-town lifestyle that the residents of Steamboat Springs enjoy reflects the area's history of economic dependence on agriculture and mining. It is apparent that the social context of the town has changed considerably with the development of the Steamboat Ski Resort, and the subsequent transition from an agricultural based economy to a primarily tourist-driven economy. However, a recent survey (Krannich, 1990) shows that most residents of Steamboat Springs are still pleased with the overall quality of life. Although the town has seen a dramatic shift in the economic base and has grown considerably over the past two decades, the atmosphere in Steamboat Springs has remained friendly, and has continued to provide a "small-town" feel to the area.

The satisfaction with the quality of life in Steamboat Springs is associated with a number of factors. Although Steamboat has grown to be one of the larger, and most popular destination ski resorts in Colorado, many residents have the desire to preserve the customs and culture of the town's agricultural history. In protecting these traditions, there is a strong "sense of community" among

the residents of the town. These attributes set Steamboat apart from the typical ski town, making it a unique place to live and to visit. Residents and tourists alike, have come to appreciate the friendly atmosphere, the availability of improved public services, and the recreational opportunities provided in Steamboat.

3.4.3 Social Concerns

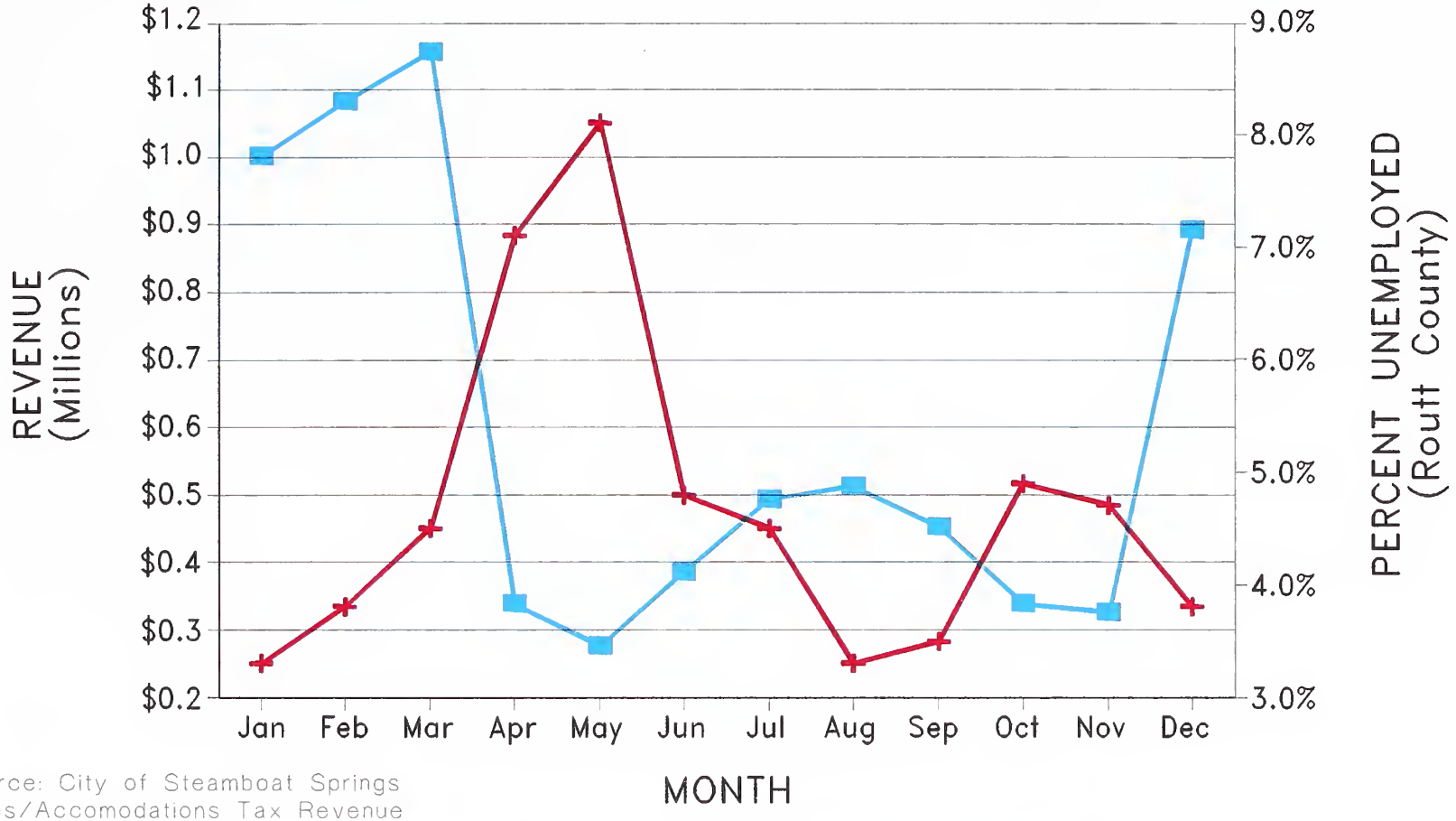
Many sociological surveys have been conducted recently in order to identify concerns that residents may have about the community. It is apparent from these surveys that the majority of concerns among the community revolve around the issue of growth and related impacts. Although the atmosphere in Steamboat Springs can be characterized by a sense of unity, surveys such as Krannich's (1990) have shown that residents have various and wide-ranging opinions about the direction in which the community is moving.

As a result of proposals to build new golf courses, fast-food franchises, and a new ski resort seven miles south of Steamboat at Lake Catamount, tension between growth advocates and those less supportive of growth has become more evident in recent years. Surveys have shown that residents agree that there is a sensitive relationship between "quality of life" attributes and growth and development patterns, but that they disagree on the nature of this relationship (Krannich, 1990). Many believe that tourist-related growth is beneficial because it enhances the economy. Others, however, perceive this type of growth to be deteriorating the traditional lifestyle of the Yampa Valley.

Many residents are concerned about community growth which encourages more tourism because this type of development will presumably augment an already present problem. With a tourist-oriented economy such as Steamboat's, there is an inherent, seasonal instability of employment and business activity. There is a considerable difference between the business that the ski season and the summer season provide. In addition, the two months after ski season and the two months prior to ski season (the off-seasons), see very little tourism (with the exception of hunting season in the Fall) and thus provide very little business activity. In the last five years, both the City and the Steamboat Springs Chamber Resort Association have increased their summer marketing of Steamboat in an effort to provide a more stable, year-round economy. However, economic indicators, such as average sales tax revenue and unemployment rates, reveal that there continues to be very large fluctuations in the yearly business activity of Steamboat, as shown in Figure 3-17, Sales Tax Revenue vs. Unemployment Rate.

Between 1988 and 1991, a period that saw considerable growth in tourism, property values and the average sale price of housing units in Steamboat Springs increased dramatically. During this period, the average sale price of vacant land (housing lots) increased by nearly 34 percent, and the average sale price of a residential home increased by nearly 30 percent (Steamboat Chamber Resort Association, 1992). During the same period though, the average annual wage of all employees in Routt County increased by only 6 percent (Colorado Department of Labor and Employment, 1992). Many are concerned that the moderate to low income residents, and particularly the residents on fixed incomes, will be unable to keep up with the impacts of the increased costs of living in the community.

Furthermore, there is a lack of new affordable housing being built. Figure 3-18, New Building Permits Issued in Steamboat Springs, depicts a recent surge in construction. Rosall Remmen and Cares (1990) report, however, that the bulk of this construction has been in the single-family residential and in the retail-commercial marketplace, and has not been oriented toward providing



Source: City of Steamboat Springs Sales/Accomodations Tax Revenue by Month. 1988-1991

Colorado Department of Labor & Employment. Local Area Unemployment Statistics. 1988-1991

LEGEND

SALES TAX REVENUE

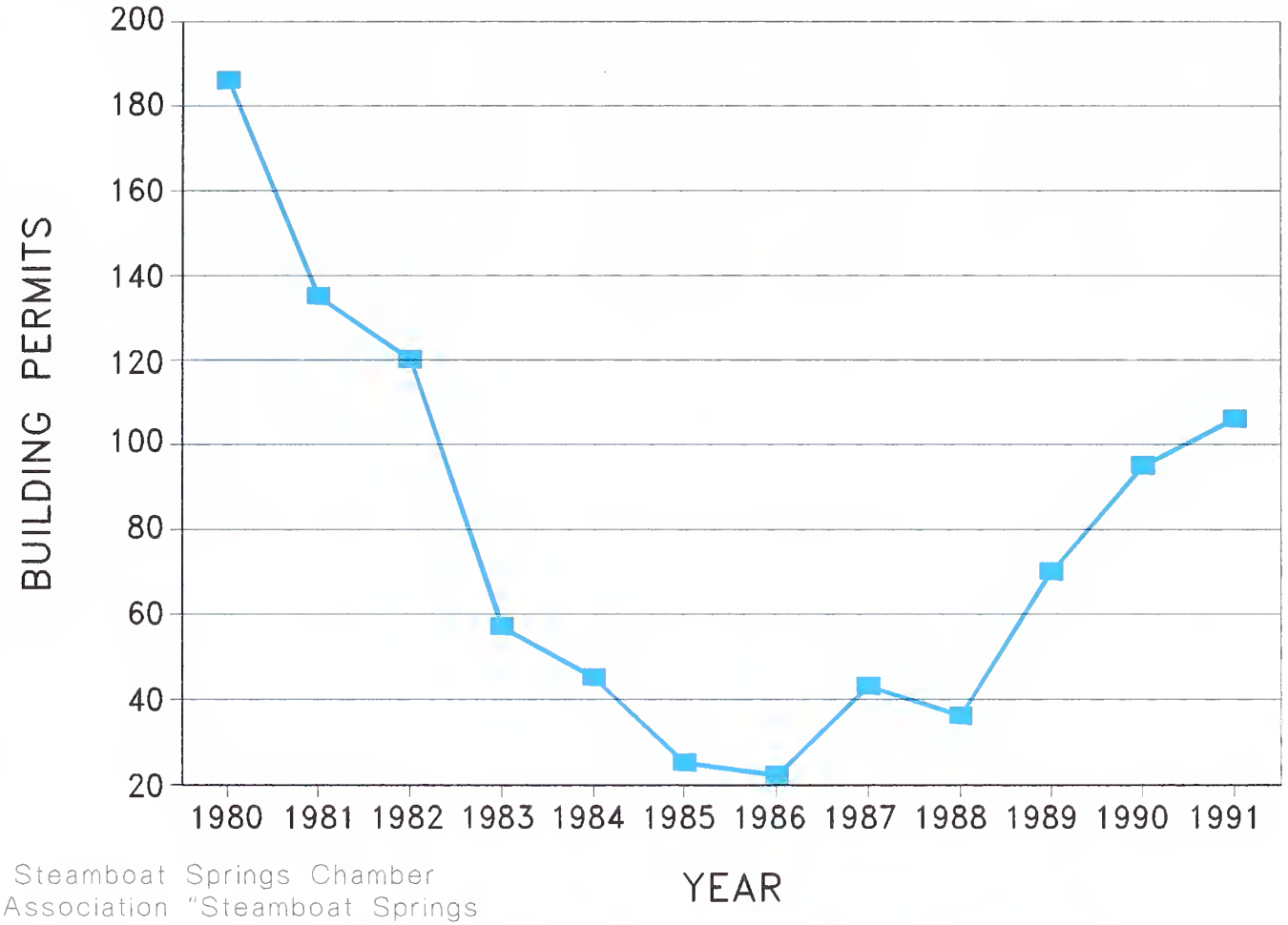
UNEMPLOYMENT RATE

Project No.: 828-1500	Design By: L. LABOVITCH	Scale: NO SCALE
File: FC3RVR91.DWG	Drawn By: T. CLARK	Date: August, 1993

FIGURE 3-17

FISH CREEK RESERVOIR EIS

SALES TAX REVENUE VS UNEMPLOMENT RATE 1991



Source: Steamboat Springs Chamber Resort Association "Steamboat Springs at a Glance." 1992

Project No.: 828-1500	Design By: L. LABOVITCH	Scale: NO SCALE
File: FC3BP.DWG	Drawn By: T. CLARK	Date: August, 1993

FIGURE 3-18

FISH CREEK RESERVOIR EIS

NEW BUILDING PERMITS ISSUED STEAMBOAT SPRINGS

affordable housing. During the first seven months of 1992, Routt County issued 85 single-family-home building permits, 25 more than the comparable period in 1991 and twice as many as in 1989 (Rocky Mountain News, 1992).

Many residents are also concerned about impacts to the physical setting of the town. Physical attributes such as traffic levels, air quality, and open space are also important to the quality of life in Steamboat Springs, and all are affected by growth and development. The physical attributes of Steamboat, including the surrounding natural environment, are valuable characteristics of the town. There is considerable concern among many residents that Steamboat is growing at a pace in which important physical characteristics are being sacrificed. A majority of people living in Steamboat feel it is important to protect the integrity of the physical environment (Krannich, 1990).

Many residents are also concerned that rapid growth could result in a reduction in the social services presently enjoyed by the community. The public services in Steamboat Springs were cited by residents as one of the more appealing characteristics of the town (Krannich, 1990). The availability and the quality of social services provided in Steamboat have helped to make the town a popular place to raise a family. The community desires to preserve the quality of its social services including schools, child care, health care, fire protection, and law enforcement.

It is clear that the social environment in Steamboat Springs is characterized by some degree of factionalism, the majority of which is centered on growth-related issues. Surveys such as Krannich's (1990), have documented these differences in opinion, and have shown that there is a need for better growth management in order to protect the quality of life attributes that the residents of Steamboat Springs value the most. A recent newspaper article has emphasized the need for "balance" between the economy and the environment. Residents of Steamboat agree that there are ways to direct growth without destroying the resources that originally brought people to the area (Rocky Mountain News, 1992). The attitudes of many residents reflect concern that the town of Steamboat is becoming less "livable," and is losing its western ambiance. The majority of residents, however, are satisfied with the quality of life Steamboat currently provides, but many feel that present growth patterns are threatening the town's lifestyle and could eventually displace entirely the true heritage of the area.

3.4.4 Demographics

Table 3-17 presents the population levels for Routt County and for Steamboat Springs over the last twenty years. Today, Steamboat accounts for nearly half of the total population in Routt County. Since 1970, the population has more than doubled. Growth rates increased dramatically with the rise in local energy development during the 70's, decreased in the early 80's as the energy market declined, and have since been increasing once again due to factors such as increased marketing, and the expansion and rising popularity of the Steamboat Ski Area. Steamboat's average annual growth rate was approximately 8 percent from 1970 to 1980, but dropped to 3.4 percent from 1980 to 1986 (USDA Forest Service, 1990). Today, there are approximately 7,000 permanent residents in Steamboat Springs. City population between 1970 and 1990 is shown graphically in Figure 3-19.

TABLE 3-17
POPULATION

LOCATION	1970	1980	1990
Routt County	6,592	13,404	14,088
Steamboat Springs	2,340	5,098	6,695

(Colorado Department of Local Affairs. 1990 Census.)

Future growth rates in Steamboat Springs will depend largely on tourism, future planning decisions, and on the development of a sound growth management plan for the city. As discussed previously, a majority of Steamboat residents are concerned about future growth patterns, and feel there is a need for a well-defined growth plan (Krannich, 1990). It is likely that the decision to build a new ski area at Lake Catamount will change the tone of future growth in the Yampa Valley, as the Lake Catamount Final EIS projects dramatic population increases associated with the development of this project.

Both permanent and peak season population projections for the next twenty years are presented in Table 3-18, City of Steamboat Springs Population Forecast, and shown graphically in Figure 3-20, Population Projections — Permanent Population, and Figure 3-21, Population Projections — Peak Season Population, (City of Steamboat Springs, 1988). These projections depict several growth scenarios and include the population of West Steamboat and the projected population increase in Steamboat Springs due to the potential development of the Lake Catamount area (does not include the population of Lake Catamount itself). It is projected that the permanent population of Steamboat Springs could reach approximately 17,000 by the year 2010 if Lake Catamount is developed. Furthermore, with the addition of West Steamboat and the development of Lake Catamount, it is estimated that the peak season population (which includes tourists) in the City of Steamboat Springs could reach 42,000 people by the year 2010.

TABLE 3-18
CITY OF STEAMBOAT SPRINGS POPULATION FORECAST

PERMANENT POPULATION:

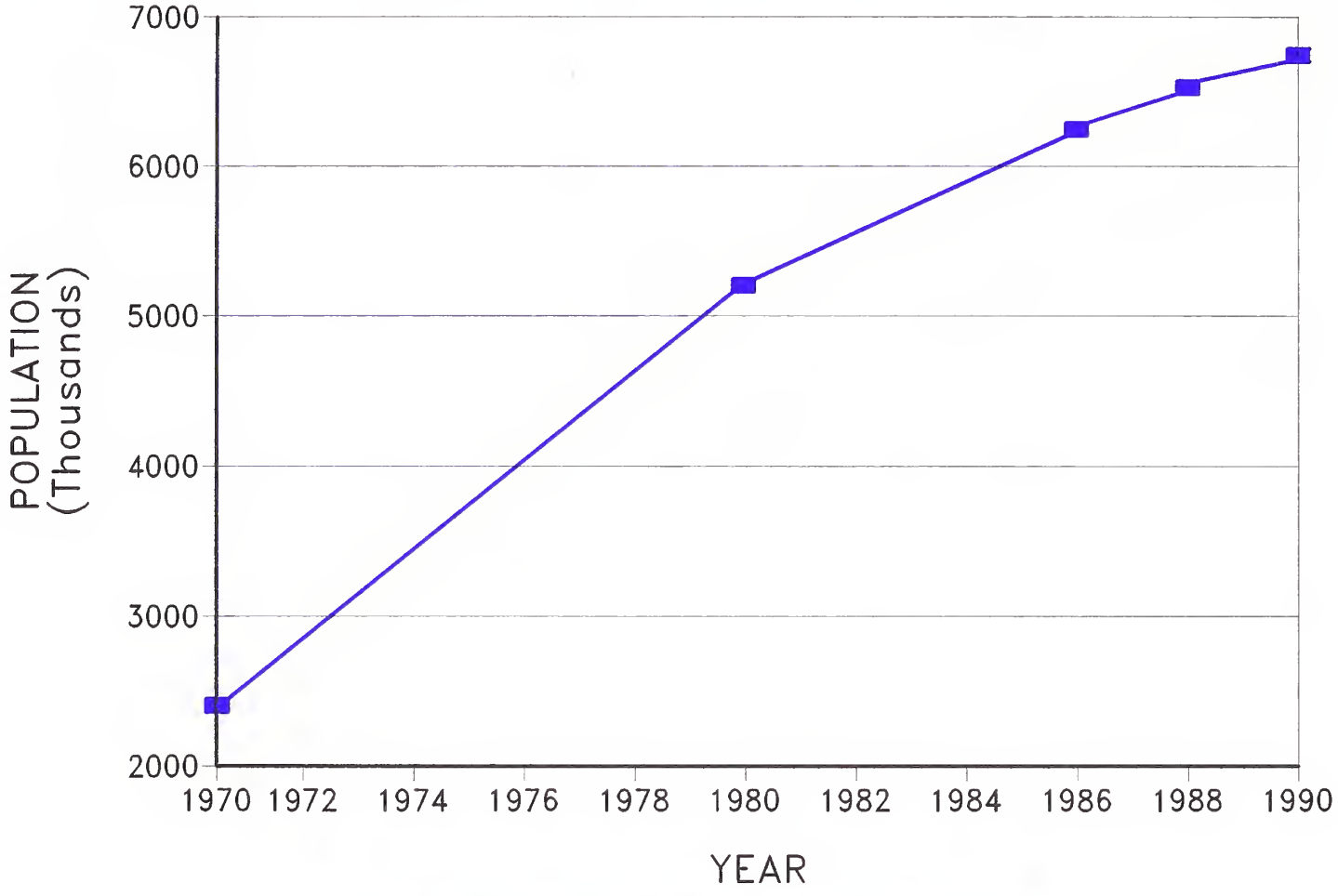
Year	Slow Growth Rate[3]:		Moderate Growth Rate[4]:		
	1.6% Annual Growth (Low Growth Scenario)	With West Steamboat[1]	3.2% Annual Growth (Moderate Growth Scenario)	With West Steamboat[1]	With West Steamboat and Catamount[2] (High Growth Scenario)
1995	6,500	7,000	6,500	7,000	7,000
1995	7,037	7,578	7,609	8,194	9,694
2000	7,618	8,204	8,907	9,592	11,960
2005	8,247	8,882	10,426	11,228	14,175
2010	8,928	9,616	12,242	13,143	16,665

PEAK SEASON POPULATION:

Year	With Slow Growth Rate:	With Moderate Growth Rate:		
	With West Steamboat[1]	3.2% Annual Growth	With West Steamboat[1]	With West Steamboat and Catamount[2]
1995	25,500	26,000	26,000	26,000
1995	30,037	30,570	31,194	32,194
2000	30,618	31,204	32,592	34,592
2005	31,247	31,882	34,228	38,228
2010	31,928	32,616	36,143	42,143

Notes:
[1]Includes West Steamboat population
[2]Includes West Steamboat population and projected population increase in Steamboat Springs due to potential development of Catamount Area (does not include Catamount population itself)
[3]1.6% Annual Growth Rate
[4]3.2% Annual Growth Rate

(City of Steamboat Springs, 1989)

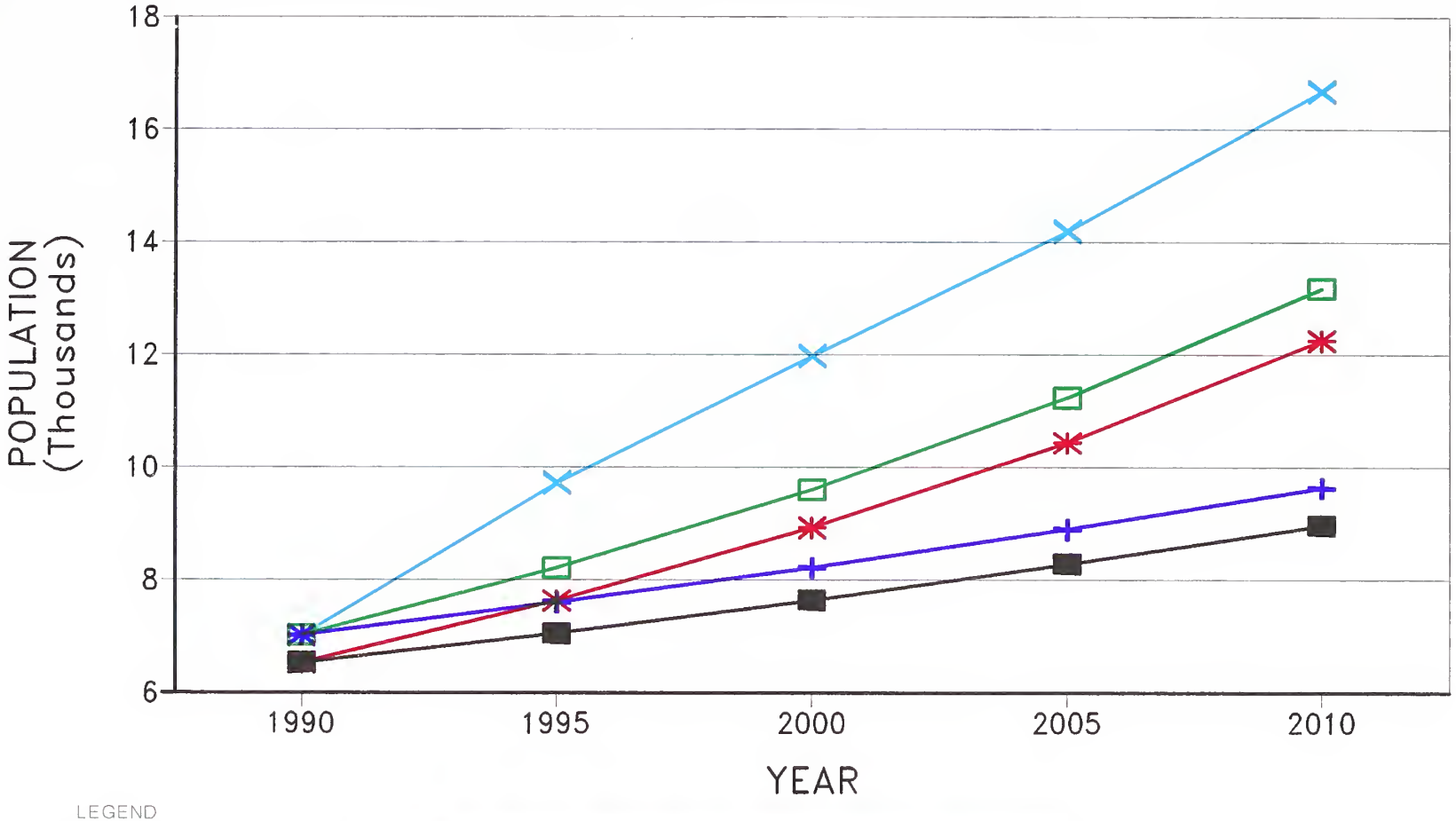


Project No.: 828-1500	Design By: J. RAY	Scale: NO SCALE
File: FC3SSP.DWG	Drawn By: T. CLARK	Date: August, 1993

FIGURE 3-19

FISH CREEK RESERVOIR EIS

STEAMBOAT SPRINGS POPULATION



LEGEND

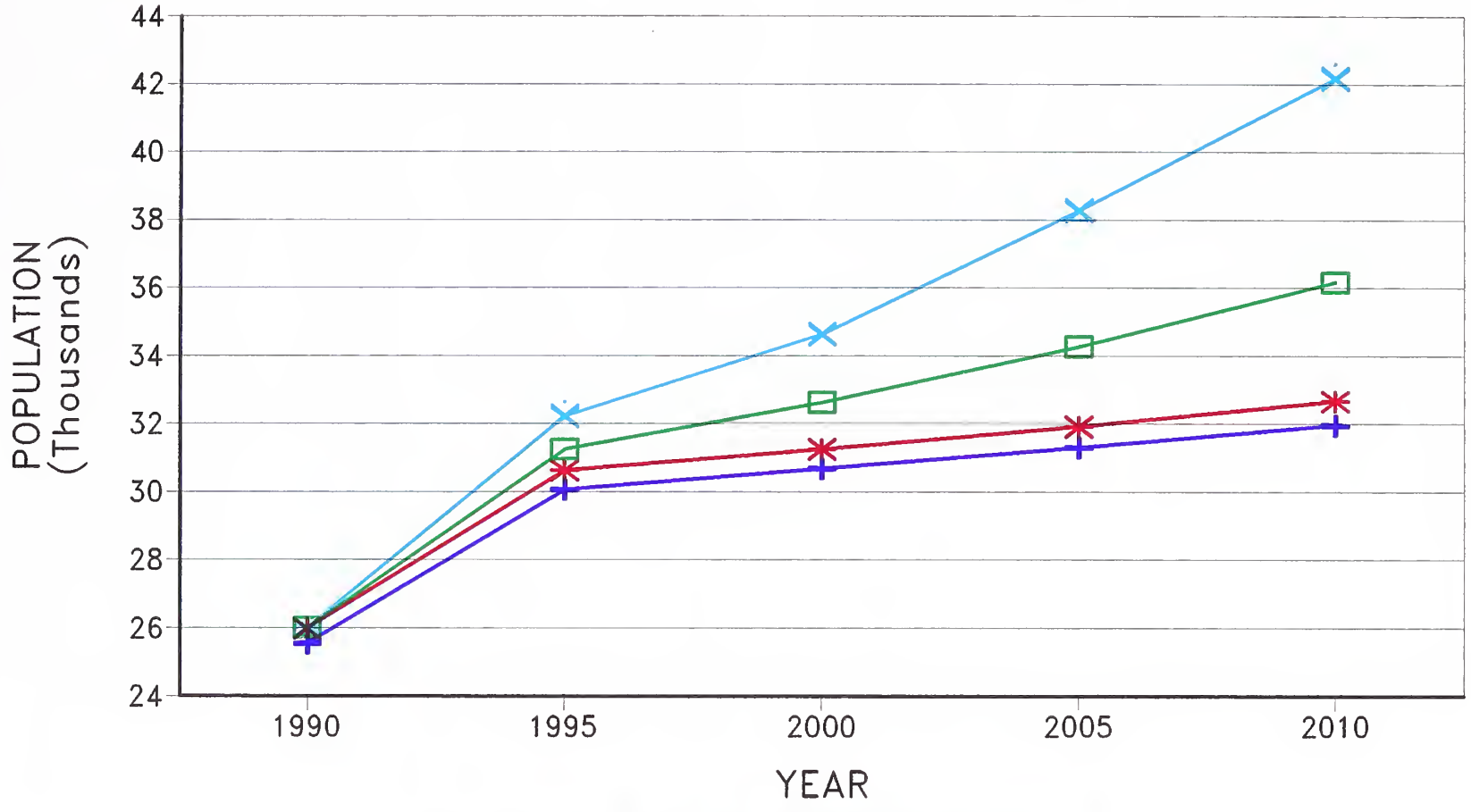
- SLOW, BASED ON 1.6% ANNUAL GROWTH RATE (LOW GROWTH SANARIO)
- SLOW-W/W.STEAMBOAT
- MODERATE BASED ON 3.2% ANNUAL GROWTH RATE (MODERATE GROWTH SANARIO)
- MODERATE W/W STEAMBOAT
- MODERATE W/W.STEAMBOAT & CATAMOUNT (HIGH GROWTH SANARIO)

Project No.	Design By:	Scale:
828-1500	J. RAY	NO SCALE
File: FC3POPRP.DWG	Drawn By: T. CLARK	Date: August, 1993

FIGURE 3-20

FISH CREEK RESERVOIR EIS

POPULATION PROJECTIONS
PERMANENT POPULATION



LEGEND

- SLOW-W/W.STEAMBOAT
- MODERATE
- MODERATE W/W.STEAMBOAT
- MODERATE W/W.STEAMBOAT & CATAMOUNT

Project No.: 828-1500	Design By: J. RAY	Scale: NO SCALE
File: FC3PKPOP.DWG	Drawn By: T. CLARK	Date: August, 1993

FIGURE 3-21

FISH CREEK RESERVOIR EIS

POPULATION PROJECTIONS
PEAK SEASON POPULATION

3.4.5 Water Availability and Community Growth

In order to better understand the relationship between water availability and community growth, a survey of 20 small water districts in the western United States was conducted (see Appendix C). For the communities surveyed, water presently is not the driving force in either promoting or preventing growth. Rather, the availability of water enables natural growth patterns within a community to occur. This is especially true for Colorado communities, such as Steamboat Springs, where available water supplies are located downstream from the headwaters of major streams and rivers. In general, a water utility attempts to plan for future growth by making certain that sufficient water sources are available to meet the demands of the community. Most utilities prepare 20 and/or 50 year master plans which enable them to define water needs well into the future and develop appropriate water supplies. With water needs defined, the utility is able to plan for capital improvement projects associated with water supply, treatment, and distribution.

In the event that water supplies become limiting, the lack of water could prevent further growth and development within a community. Taos, New Mexico, is an example of a community with growth restrictions, partially caused by the lack of sufficient water supplies. In desirable tourist communities, such growth restrictions could result in increases in the cost of living and subsequent changes in the demographics of a community.

Historically, water availability in Steamboat Springs has neither promoted nor prevented growth within the community. Rather, other factors such as the ranching and agricultural heritage, small-town lifestyle, physical beauty, quality of life, recreational opportunities, ski industry and tourist aspects of the community have primarily been responsible for growth and development within the area.

Historically, the City and Mt. Werner have obtained water rights and have developed water projects to meet their present and future water demands, as discussed in detail in the *Water Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992b). Approximately 2,238 AF of water storage has been available for the past twenty years. During this same 20-year period, growth in the community has proceeded independently of water supply.

The population has shown a relatively dramatic, boom-bust cycle, as shown in Figure 3-19, with population increasing during the energy development period, decreasing as the energy markets declined, and rising again with the expansion and development of the Steamboat Ski Area (Forest Service, 1990).

The role of water in the growth and development of Steamboat Springs has been minimized since the City and Mt. Werner water utilities have anticipated, and planned for, the future needs of the community. Since sufficient water supplies have historically been available, water has neither promoted, nor prevented, growth in Steamboat Springs. The availability of water, however, has enabled growth to occur.

3.4.6 Community Survey of Potential Capital Improvement Projects

In 1992, the City of Steamboat Springs conducted a community survey to determine priorities for potential capital improvements (Appelbaum, 1992). Citizens were requested to rate potential capital improvement projects as 'high priority', 'medium priority', 'low priority', or 'not a priority'. Eleven capital improvement projects were rated ranging from developing affordable housing to enlarging the Fish Creek Reservoir, to improving the ice-skating rink. Of the eleven projects, enlarging the Fish Creek Reservoir was rated as the fourth highest priority. Of those surveyed,

32.1% rated enlarging the reservoir as a high priority and 36.8% rated it as a medium priority. Only 15.8% of those surveyed felt that enlarging Fish Creek Reservoir was not a priority. Results of the community survey are shown in Table 3-19, Priorities for Potential Capital Improvements, and indicate wide-range community support for the proposed reservoir enlargement.

TABLE 3-19
PRIORITIES FOR POTENTIAL CAPITAL IMPROVEMENTS:
PERCENTAGE RESPONDING

POTENTIAL CAPITAL IMPROVEMENTS	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY	NOT A PRIORITY
Developing affordable housing	59.3	24.1	8.8	7.8
Continuing the Yampa River Trail and developing additional trail loops	48.9	33.9	10.7	6.8
Purchasing land for open space	36.8	29.9	17.4	35.9
Enlarging the Fish Creek Reservoir	32.1	36.8	16.4	14.7
Building a theater and performing arts center	21.6	33.4	25.2	19.7
Improving and fully enclosing the ice skating rink	21.2	33.7	27.8	17.3
Building a public golf course	18.3	23.3	23.3	35.0
Developing additional athletic fields	16.5	31.4	30.7	21.5
Expanding and improving the Steamboat Springs airport	15.7	27.8	28.8	27.8
Building a downtown parking structure	18.3	23.2	31.0	31.4
Providing art in public places	11.5	30.2	33.1	25.2

(from Appelbaum, 1992)

3.4.7 Water Utility Financing

3.4.7.1 City

The City, through its Public Works Department Utility Division, provides water and sewer services within the City service area (which excludes the area served by Mt. Werner). The City and Mt. Werner water service areas are shown in Figure 3-9. The existing water and sewer systems have been developed and constructed over the years in a continuing effort to meet rising demands and improve services to the City's customers. Costs of operating, maintaining, and financing system improvements are met primarily from the revenue derived from rates and fees to users (B&V, 1988).

In its 1992 budget (City of Steamboat Springs, 1991), the Utility Systems Division established seven goals and objectives pertaining to the water system. These goals include the following:

- Actively promote water conservation
- Establish elevational limit on water service area
- Improve reliability of water distribution system
- Insure that a safe, closed water distribution system is maintained
- Implement metered rate billing system
- Protect City water rights
- Operate and maintain safe reservoirs

The City is actively pursuing these goals and objectives. It has received two grants to study water conservation; has recently completed (1992) the construction of the interconnect system to Mt. Werner and the infiltration galleries and is in the process of implementing a metered rate billing system. The City Council has recently adopted an ordinance to provide for metered water rates. This ordinance in included in Appendix H.

The City's water fund is an enterprise fund. The water utility, therefore, is financed and operated in a manner similar to a private business enterprise. Services provided by the water fund are intended by City Council to be predominantly self-supporting through user charges (City of Steamboat Springs, 1991).

User charges in the form of monthly customer billings and tap fees are the major sources of revenue to the water fund. Additional revenue sources include property and sales tax (debt service subsidy) revenues (B&V, 1988).

Major expenditures include debt service for prior water distribution and filtration plant capital improvements; personnel costs; and capital, operation, and maintenance costs associated with the supply, treatment, and transmission of water.

Due to the recent passage of Amendment 1, the tax limitation amendment, the 1993 City budget is currently under review. Since Amendment 1 limits the City's subsidy to enterprise funds to 10%, the 1993 water fund budget is being re-evaluated (Today, 1992).

3.4.7.2 Mt. Werner

The Mt. Werner Water and Sanitation District was created in 1967 to provide water and sewer services to the developing ski area. Its primary water supply is from Fish Creek and its secondary source is from the well fields, adjacent to the Yampa River. The Mt. Werner district is almost entirely within the city limits of Steamboat Springs and furnishes potable water from the filtration plant, which is jointly owned by the City and Mt. Werner and managed by Mt. Werner (Fetcher, 1992).

Mt. Werner is governed by an elected Board of five individuals who must be residents or property owners within the Mt. Werner district. As a quasi-municipal subdivision of the State of Colorado under the special district law, it is empowered to levy taxes on property owners within the district. Beginning with an initial mill levy of 15 in 1967, it has a present mill levy of zero (Fetcher, 1992).

In order to encourage conservation and to comply with Colorado law, Mt. Werner has changed from a flat rate water charge to a metered rate water charge. While making this conversion, Mt. Werner has also raised its rates. A copy of the letter to Mt. Werner customers explaining the 1993 rate change is presented in Appendix H.

As with the City, the main sources of revenue for Mt. Werner include user fees in the form of customer billings and tap fees. Additional sources of revenue include water revenue from the City (for the City's share of treatment costs) and a tax rebate from the City. The tax rebate is for property taxes levied against Mt. Werner residents for the City's share of the water filtration plant. The City owns approximately two-thirds of the filtration plant that was paid for by a bond issue. To repay the bond, a mill levy was assessed on the entire City, including residents of the Mt. Werner district. Consequently, Mt. Werner receives a tax rebate annually from the City, and will continue to do so until the year 1999, at which time, the mill levy and rebate will be discontinued.

Major expenditures for Mt. Werner include personnel, capital, operation, and maintenance costs associated with the supply, treatment, and transmission of water.

3.4.7.3 Financial Arrangement for Proposed Reservoir Expansion

The preliminary cost estimate for the proposed Fish Creek Reservoir expansion and the associated improvements is six million dollars. A financial arrangement between the City and Mt. Werner has been reached in which the two entities would share the project costs. The City's share would be approximately 25%, and Mt. Werner's share would be approximately 75% of the total project costs. The water storage capacity received by each entity would be proportional to the share of the project for which each entity pays. In regard to storage capacity, the City would receive approximately 570 AF of additional storage and Mt. Werner would receive approximately 1,710 AF of storage capacity. The City Council Resolution, dated August 25, 1992, authorizing the City of Steamboat Springs to share in the cost of the proposed reservoir expansion is presented in Appendix I. This resolution was conditioned upon Forest Service approval of the Permit Application.

In order to secure financing for the proposed project, Mt. Werner obtained a loan agreement from the Colorado Water Resources and Power Development Authority (Authority) on September 23, 1992 in the amount of $4,630,000 at an annual interest rate of 6.29 percent. Mt. Werner would utilize its reserves to finance the remainder of the $6,000,000 project, if the project was approved.

The loan would be entirely repaid in 20 years. Mt. Werner would make payments for the entire 20-year period and the City would contribute to the payments for the final 12 years of the loan. Mt. Werner would rely primarily upon service charge revenues, the City's property tax rebate ($200,000 per year for the first eight years of the loan - discussed in Section 4.6.2), and the City's proposed annual contribution of approximately $175,000 (for the final 12 years of the loan) in order to repay the loan from the Authority. Potential sources of revenue for the City's contribution for the final 12 years would include user charges, tap fees, and most likely, debt service subsidies from the general fund (Birch, 1992). A copy of the proposed reservoir financial plan is included in Appendix I.

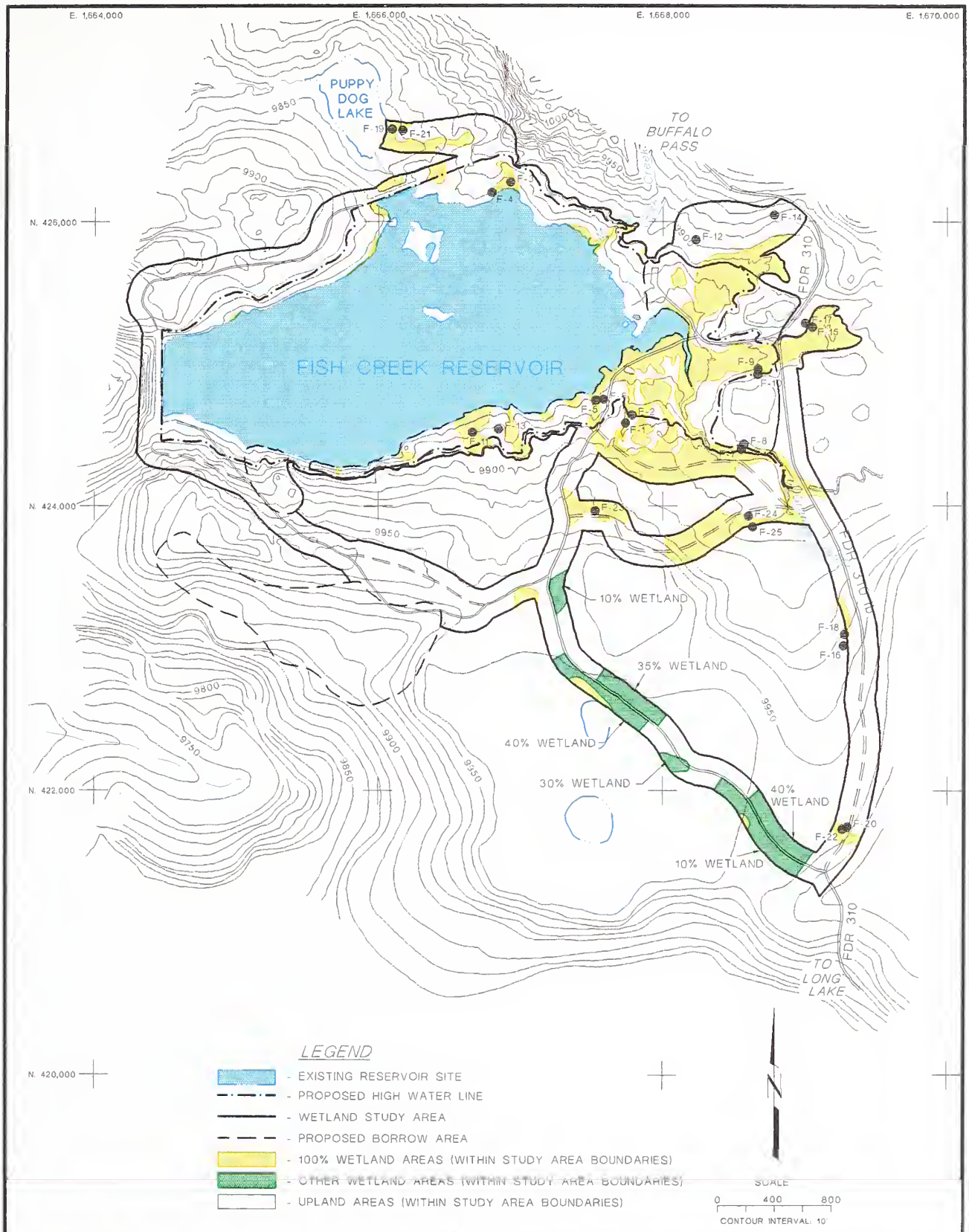
3.5 WETLANDS

3.5.1 Introduction

Information and data used to prepare the following discussion was developed as a result of field studies completed at the project study area during portions of July, September, and October of 1992. The field studies were conducted, following a review of proposed construction alternatives and project maps, in accordance with methodology set forth in the publication *Corps of Engineers' Wetlands Delineation Manual* (1987) for a "routine on-site determination". Details of the methodologies used to complete the field surveys, as well as the results of the field effort, can be found in the document *Wetland Technical Memorandum - Fish Creek Reservoir Expansion Project* (Cedar Creek, 1992a) submitted to the U. S. Forest Service. A discussion of wetlands functions and values is presented in *Fish Creek Reservoir: Functions and Values of Wetlands* (Cedar Creek, 1993).

3.5.2 Wetlands Delineation

For the purposes of the wetland discipline, the term "project area" includes the acreage as shown on Figure 3-22, Reservoir/Upland Boundaries. Yellow stippling on the map indicates areas for which wetlands were mapped in total and included those acreages associated with the proposed reservoir expansion, borrow area and campground alternatives as well as the proposed spillway and



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FIGURE 3-22

FISH CREEK RESERVOIR EIS

RESERVOIR WETLAND/UPLAND BOUNDARIES

transportation corridor alternatives, where new construction is proposed. Green stippling indicates where the extent of wetlands was estimated along proposed transportation corridors and where the existing road would be used in an upgraded condition. Upgrading would consist of graveling and would not likely disturb the adjacent wetlands.

Wetlands within the study area (Figure 3-22) occur primarily over low-lying, gently sloping topographies, though wetlands have developed in more level meadows at higher elevations where run-on and snowpack give rise to wetter soil moisture regimes. These wetlands support plant communities consisting almost entirely of wetland (FAC, FACW, OBL classes) plant species including various sedges, rushes, and tufted hairgrass. Tufted hairgrass is also the dominant species in wetland transition zones and in wetland meadows at the drier end of the soil moisture spectrum.

Wetland meadow soils have dark chroma matrices of 2 or less and exhibit bright mottles with values/chromas ranging from 3/6 to 4/6. Gleyed soils can occasionally be found at deeper depths in the soil profile. In terms of wetland hydrology indicators, these soils are normally saturated and occur within obvious drainage topographies. Standing water was also present near many wetland meadow sample points, though water depths rarely exceeded a few inches at the time of the field surveys.

By comparison, upland meadows within the study area support a wide variety of plant species. The percentage of upland species (FACU and UPL classes) comprising the relative plant cover at meadow sample sites ranges from 46 to 90 percent, and includes such species as eriogonum, grouse whortleberry, gland cinquefoil, strawberry, sheep fescue, and mountain brome. Soil matrix chromas range from 2 to 6 and no mottling or gleying was found. Lying above the adjacent wetlands, these sites displayed no wetland hydrology characteristics. Upland meadow transition zones display essentially the same soil and hydrology characteristics as upland meadows but support higher percentages of FAC and FACW species.

Wetlands along the shoreline circumference of Fish Creek Reservoir and the southeast portion of the shoreline of Puppy Dog Lake are characterized by vegetation communities composed almost entirely of wetland vegetation. Dominant species include rushes, sedges, diamond-leaf willow, and tufted hairgrass. Soils exhibit low chromas and/or mottling and are inundated or saturated at or near the surface. Wetlands occurring along Granite Creek and other unnamed drainages, support a vegetation community dominated by sedges, rushes and willow species. Tufted hairgrass, and occasionally common reed, are also dominant vegetation community components along the more gently sloping portions of these drainages. Soils are gleyed or exhibit bright mottles in soil matrices having chromas of 2 or less. Wetland hydrology indicators include wetland drainage patterns, soils saturated to within 12 inches of the surface, and occasionally inundated soil profiles.

The uplands associated with these wetlands support plant communities dominated by conifers, eriogonum, strawberry, and various upland-classed grass species. Wetland-classed plants make up from 10 to 30 percent of the plant community at the sample sites. Soils have matrix chromas ranging from 2 to 4 with no evidence of mottling or associated wetland hydrology indicators.

Upland mixed conifer forests, characteristic of the remainder of the study area, are dominated by a variety of upland vegetation species including Englemann spruce, lodgepole pine, and grouse whortleberry, with a virtual absence of wetland-classed vegetation. Soil matrices exhibit chromas of 4 or brighter and there was no indication of wetland hydrology. Forest sites at lower elevations and sites considered upland transition zones normally support a slightly greater percentage of wetland-classed species within a predominantly upland plant community. Wetland vegetation in

these areas consists primarily of tufted hairgrass and alpine timothy. Soils have matrix chromas of 3 or greater with no evidence of mottling or gleying. No indications of wetland hydrology were found.

3.6 SOILS

3.6.1 Introduction

Existing Forest Service mapping and data were used to develop the following discussion of the soil resources of the project area (John, 1992). Field surveys were completed in the Fish Creek Reservoir area in the summer of 1988 by the Forest Service. A map depicting soil mapping units was then drafted at a scale of 1 inch:2,000 feet based on the results of these surveys. Data used to prepare this section consisted of Forest Service field pedon descriptions, map unit descriptions, and interpretive summaries based on soil, physical, and chemical characteristics. No site-specific soil surveys were completed as a part of this project.

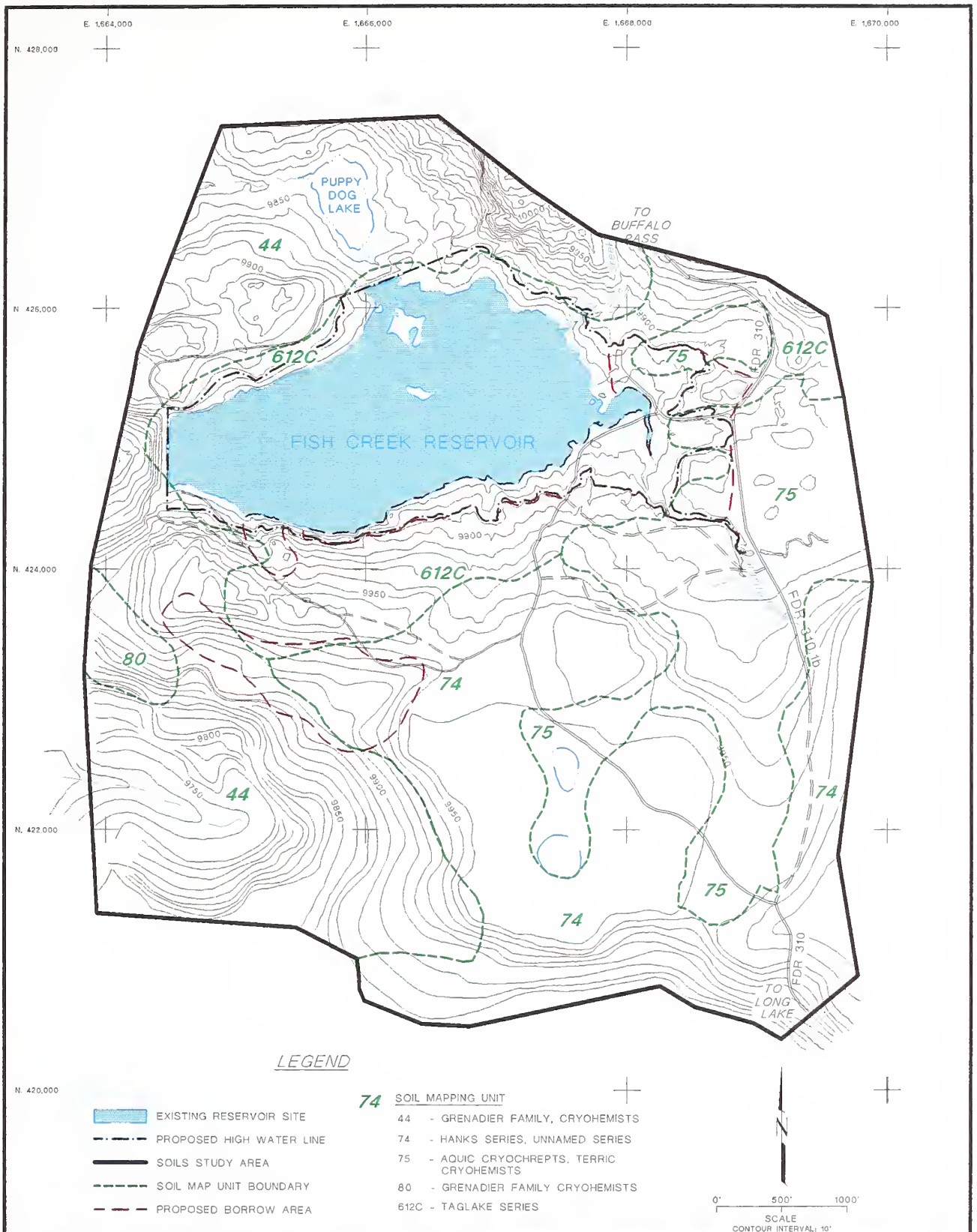
3.6.2 Soils Description

A total of five mapping units were identified within the study area as depicted on Figure 3-23, Soils Location Map. A summary of pertinent soil characteristics for these units is presented in Table 3-20, Summary of Selected Map Unit Characteristics. The map units consist of a single dominant series, complexes, or soil associations indicating a highly variable soil mantle overlying the study area.

Soils overlying the acreage bordering Fish Creek Reservoir (Map Unit 612C) are deep and forming in glacial till parent materials. Soil textures range from very stony sandy loams at and near the surface to very stony loamy sands at depth. Coarse fragment content ranges from 50 to 65 percent throughout the profile and soil pH values are 5.4 to 5.8. Water erosion, compaction, and revegetation potentials for this map unit are all rated as moderate.

TABLE 3-20
SUMMARY OF SELECTED MAP UNIT CHARACTERISTICS

MAP UNIT NO.	MAP UNIT COMPONENT	DRAINAGE	PERMEABILITY	AVAILABLE WATER CAPACITY	RUNOFF POTENTIAL
44	Grenadier family	Well	Moderately rapid	Very low - low	Moderate
	Cryohemists	Poor	Moderately rapid	High	Very slow or ponded
74	Hanks series	Well	Moderate	Low	Moderate
	Unnamed series	Well	Moderate	Low	Moderate
75	Aquic Cryochrepts	Somewhat poorly	Moderate - moderately slow	Moderate - High	Slow
	Terric Cryohemists	Very poorly - poorly	Moderate	High	Very slow or ponded
80	Grenadier family	Well	Moderately rapid	Very low - low	Moderate
	Cryohemists	Very Poor	Moderately rapid	High	Slow or ponded
612C	Taglake series	Well	Moderately rapid	Low	Slow



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FIGURE 3-23

FISH CREEK RESERVOIR EIS

SOILS LOCATION MAP

Soils occurring in the western portion of the project area on valley side-slopes and bottoms (Map Unit 44) are forming in residuum/colluvium from volcanic rock sources and decomposing organic materials, respectively. These soils are typically moderately deep to deep. Soils overlying side-slopes exhibit very flaggy loam to extremely flaggy sandy loam textures with the coarse fragment content of the soil profile ranging from 60 to 65 percent throughout. Soil pH values are typically 5.0 to 5.4. Soils of the valley bottoms generally consist of decomposing vegetative material to a depth of over 50 inches, below which is soil material with loamy textures. The coarse fragment content of these soils is very low and pH values range from 5.4 to 5.8. The water erosion, compaction, and revegetation potentials of the dominant soils of this map unit are moderate, slight, and low, respectively. Rock outcrops make up about 35 percent of this unit. Soil Map Unit 80 occurs over a portion of the southwestern part of the project area. This unit is similar to Map Unit 44, in terms of soils present, though approximately 60 percent of the unit is composed of rock outcrop formations. Higher soil coarse fragment contents, in the form of stones and cobbles, may also occur in soils overlying sideslopes.

Map Unit 74 occurs in the southeastern portion of the project area on glacially scoured ridges. The dominant soils of this unit are deep and are developing in residuum from volcanic rocks and glacial till. Soils forming in residuum have textures ranging from gravelly fine sandy loams to gravelly loams with coarse fragment contents of 20 percent or less throughout the profile. Soils forming in glacial till exhibit textures ranging from cobbly loams at the surface to very cobbly loamy fine sands at depth. Coarse fragment content of these soils varies from 15 to 45 percent. The pH values for the soils of this unit ranges from 4.6 to 5.2. Water erosion potential of the soils of this unit is rated as moderate. Soil compaction potential ratings for these soils range from moderate to severe while revegetation potentials range from low to moderate. Soils in the eastern portion of the study area (Map Unit 75), overlying more gentle slopes in drainages and valley bottoms are forming in alluvium and decomposing organic materials. These soils are deep to very deep. Alluvial soils have textures ranging from cobbly and very cobbly sandy loams, to gravelly sandy clay loams. Coarse fragment content ranges from 15 to 45 percent increasing with depth. Soil pH values vary widely from 4.8 to 6.8. Soils forming in organics exhibit a surface layer of organic material 15 to 50 inches thick over a stratified subsurface soil layer with textures ranging from gravelly sandy clay loams to gravelly loamy sands. Coarse fragment content ranges from 15 to 35 percent and pH values range from 5.4 to 6.4. The water erosion hazard for this unit is rated as low. Compaction potential, for the soil rated, is moderate. Revegetation potential ratings range from low to moderate.

3.7 VEGETATION

3.7.1 Introduction

The following discussion is based on both existing information and the results of site-specific field studies conducted in July, 1992. Existing information includes Forest Service file data, background material for sensitive plants, herbarium specimens of those sensitive plants, and both color infra-red and true color aerial photography. Field efforts necessitated two separate trips, one for sensitive species in July during the period of anthesis (flower blooming), and a second at a later time. General vegetation community identification, mapping, and characterization work was completed in late July. Details of the methodologies used to complete the field work and the results of surveys are found in the document *Vegetation Technical Memorandum-Fish Creek Reservoir Expansion Project* (Cedar Creek, 1992b) on file with the U.S. Forest Service. Figure 3-24, Reservoir Vegetation Map, depicts the study area for the vegetation discipline and the boundaries of the vegetation communities identified.

3.7.2 Vegetation Communities

Three vegetation communities were identified and mapped as a result of the field surveys. These communities include the Mixed Conifer Forest, Upland Meadow, and Wetlands communities. Two additional features of the physical environment were also delineated during the vegetation studies to aid wildlife habitat evaluations. These features include open water and disturbed areas. Table 3-21, Selected Vegetation Community Data, presents selected data for the three vegetation communities identified on site.

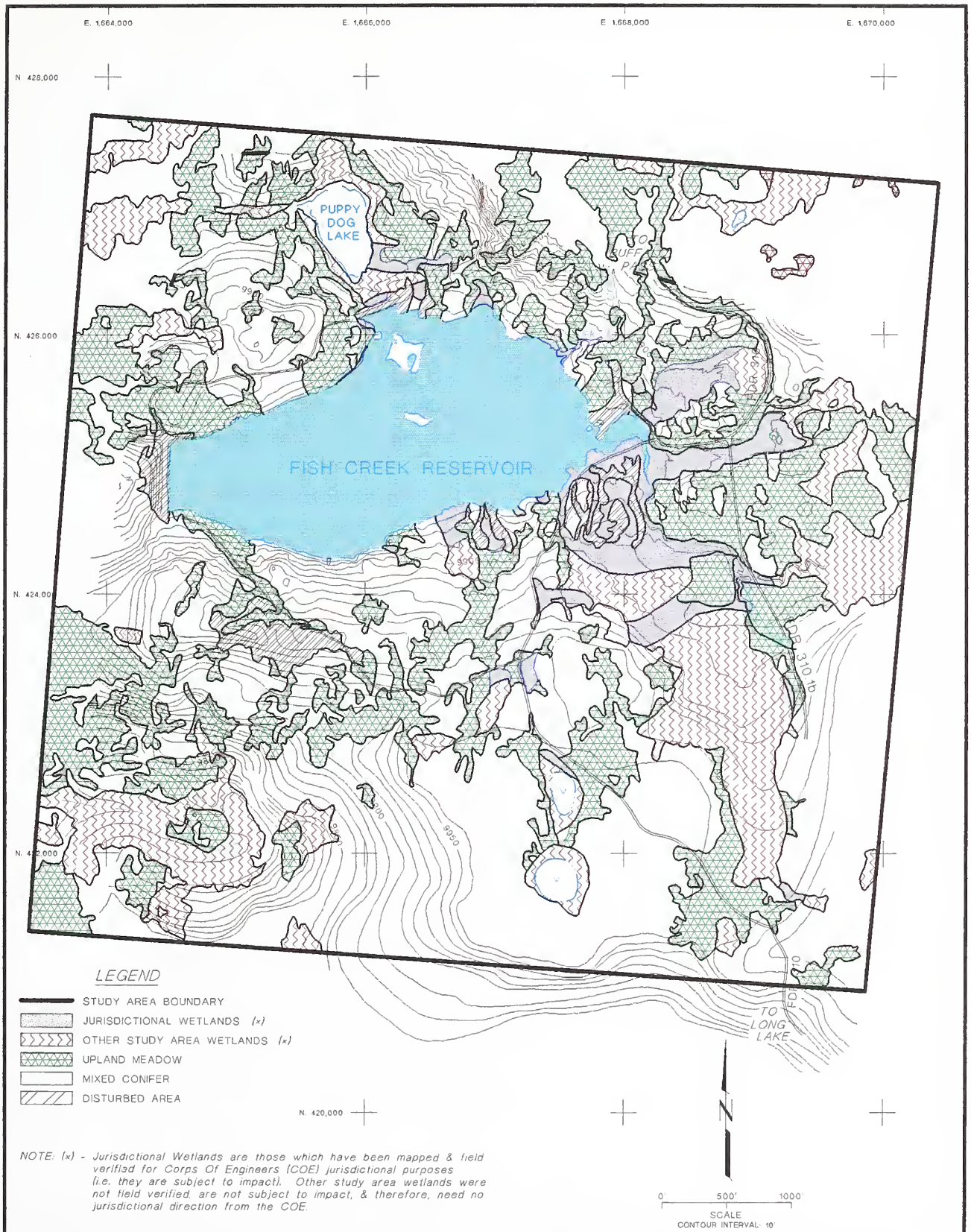
TABLE 3-21
SELECTED VEGETATION COMMUNITY DATA

VEGETATION TYPE	ECOLOGICAL STATUS	CONDITION AND TREND	AVERAGE GROUND COVER (%)	ANNUAL HERBACEOUS PRODUCTION lbs. (dry wt.)/ac	CARRYING CAPACITY AUMs[1]/ac
Mixed Conifer	Late seral	Excellent, stable	85	300	0.071
Upland Meadow	Late seral	Good, stable	64	1,300	0.25
Wetlands	Late seral	Good, stable	93	2,300	0.55

[1]AUMs = Animal Unit Months

The Mixed Conifer community is the most extensive vegetation type of the study area occupying 487 acres. It occurs on all slopes, aspects, and topographic positions except low-lying wet meadows. A total of 37 plant species were observed in this community with Englemann spruce (*Picea englemannii*), lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*) and grouse whortleberry (*Vaccinium myrtillus*) being the most dominant species. Tree canopy cover is often over 60 percent and ground cover of living plants averages 85 percent. Ground cover, however, is highly variable depending upon shading from the tree canopy and underlying soils, and can range from less than 20 percent under dense tree canopy cover to 98 percent in more open areas. Tree and shrub densities were estimated to be 450 stems and 18,000 plants per acre, respectively. Vegetation structural diversity of this community is considered to be excellent except in areas of extensive bedrock exposures, where little understory is present. Total current annual herbaceous production was estimated to be about 300 pounds (dry weight) per acre with about 50 percent of this production usable by livestock. This level of production reflects an overall carrying capacity of 0.071 AUMs (Animal Unit Months) per acre, for both livestock and/or wildlife, under a program of proper forage utilization. Condition and trend of the Mixed Forest community was estimated to be excellent and stable, respectively. The ecological stage of this community was classed as late seral.

The Upland Meadow community is the second most extensive vegetation type in the study area exhibiting 185 acres. This community is typically located along upper slopes and rolling hills between the Mixed Conifer and Wetlands vegetation types. A total of 52 species were identified in this type resulting in a comparatively high species diversity. Structural diversity, conversely, was only fair owing to the single stratum (herbaceous) present. Dominant species included tufted hairgrass (*Deschampsia caespitosa*), timothy (*Phleum alpinum*), elk sedge (*Carex geyerii*), wiregrass (*Juncus* sp.), and green needlegrass (*Stipa viridula*). Ground cover of living plants was estimated to average about 64 percent, though values as high as 80 percent were recorded in more dense stands of grasses and forbs. Woody plant density averaged about 550 plants per acre. Total current annual production was estimated to be 1,300 pounds (dry weight) per acre of which about 40 percent was usable by livestock. This translates to a carrying capacity of approximately 0.25 AUMs per acre. This community is considered to be in a late seral ecological stage with condition and trend estimated to be good and stable, respectively.



NOTE: (x) - Jurisdictional Wetlands are those which have been mapped & field verified for Corps Of Engineers (COE) jurisdictional purposes (i.e. they are subject to impact). Other study area wetlands were not field verified, are not subject to impact, & therefore, need no jurisdictional direction from the COE.

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File:	Drawn By:	Date:
FC3VEG.DWG	T. CLARK	August 1993

FIGURE 3-24

FISH CREEK RESERVOIR EIS

RESERVOIR VEGETATION MAP

The wetlands community is the least extensive vegetation type in the study area as it is found on 146 acres. Additional discussion of this type is found in Section 3.5. As indicated on Figure 3-24, "jurisdictional wetlands" are those which have been mapped and field verified for Corps of Engineer (COE) jurisdictional purposes (ie. they are subject to impact by the proposed project or project alternatives). "Other study area wetlands" were not field verified, are not subject to impact, and therefore, need no jurisdictional direction from the COE. The wetlands community is typically found in the lowest topographic positions, where seeps occur near the surface. A total of 43 species were observed in this community. Like the Upland Meadow, the structural diversity of this community is rated as fair, due to the single dominant herbaceous stratum present. Dominant vegetation species include tufted hairgrass, sedges, planeleaf willow (*Salix planifolia*), and Baltic rush (*Juncus balticus*). Ground cover of living plants was estimated to be 93 percent on average, but can reach as high as 100 percent in the densest areas. Overall, shrub density was estimated to be about 800 stems per acre. Carrying capacity for this community was calculated to be 0.55 AUMs per acre assuming a total current annual production of about 2,300 pounds (dry weight) per acre, a 50 percent usable forage ratio, and proper grazing management. Estimated to be in the late seral stage, the Wetlands community exhibits good range condition and stable trend.

3.7.3 Sensitive Species

Evaluation of sensitive species' literature (USDI, 1985) and information provided by the US Fish & Wildlife Service to the US Forest Service, under informal consultation, indicated that several sensitive floral species could possibly occur in the study area as indicated in the Table 3-22, Sensitive Plant Species Potentially Occurring On-Site.

TABLE 3-22
SENSITIVE PLANT SPECIES POTENTIALLY OCCURRING ON SITE

SCIENTIFIC NAME	COMMON NAME	FEDERAL LISTING
Claytonia lanceolata flava	Spring beauty	C2
Cypripedium fasciculatum	Brownie ladyslipper	C2*
Ipomopsis aggregata weberi	Skyrocket gilia	C2*
Mimulus gemmiparus	Weber monkey-flower	C2
Penstemon harringtonii	Harrington beardtongue	C2
Potentilla effusa rupinicola	Larimer cinquefoil	

*Status expected upon the next notice of review of candidate plants.
C2 - Category 2 Candidate (pending additional information on species' status)

Following intensive systematic surveys during the period of anthesis, none of the sensitive plants listed above were observed within any area which may be disturbed, including a large surrounding buffer. A list of the plants which were observed is provided in the document *Vegetation Technical Memorandum-Fish Creek Reservoir Expansion Project* (Cedar Creek, 1992b).

3.7.4 Range Management

According to Forest Service personnel (Schmitzer, W., 1992), the proposed project area is within the Long Lake Allotment which consists of 9440 acres. The registered permittee is the Stratton Sheep Co. of Rawlins, Wyoming, who operates one band of sheep (1000 ewe/lambs) with a season of use between July 16th and September 10th of each year. This totals to a utilization of about 350 AUMs.

The carrying capacity of the vegetation types found in and around the project area were presented above in Table 3-21. Based on the acreage of these types found in the 940 acre study area, a total of about 160 AUMs could be available in this area. However, owing to a restriction of sheep use of a large buffer zone around the reservoir, this forage would be largely unavailable to the permittee.

3.8 WILDLIFE/FISHERIES

3.8.1 Introduction

Information regarding wildlife species and current habitat conditions within the Fish Creek Reservoir expansion project area was obtained from a review of existing published sources, Colorado Division of Wildlife (CDOW) file and computer database information, and on-site field surveys.

As indicated in Section 3.7, Vegetation, three major vegetation communities/wildlife terrestrial habitats (mixed conifer, upland meadow, and wetland) occur within the project area. Open water associated with Fish Creek Reservoir, small ponded areas, and creeks provides aquatic habitat in the project area. Wildlife populations within the project area are discussed in the following sections: Big Game; Other Mammals; Raptors; Waterbirds and Upland Gamebirds; Other Avifauna; Reptiles and Amphibians; Fish; and Threatened, Endangered, and Candidate Species.

3.8.2 Big Game

The project area occurs within CDOW Game Management Unit 14 . Mule deer, elk, black bear, and mountain lion are expected to occur on or near the project area. Habitat preferences of these species are reviewed in the *Wildlife Technical Memorandum* (Cedar Creek, 1992c). Black bear and mountain lion are known to occur in the Routt National Forest but are not expected to be common in the vicinity of the project area, due to the intensity of human recreational activities associated with Fish Creek Reservoir, and trail systems in the area. No observations of black bear or mountain lion or their definitive sign (scat or tracks) were made during field surveys in the project area.

Mule deer and elk populations within the region of the project area exhibit significant seasonal movement, with most shifts in distribution occurring as a result of elevational migration in response to weather patterns and snow cover. Deer and elk habitat within the project area is used solely as summer range because heavy snowfall accumulations occur during the winter months. Mule deer and elk migration from summer range in the region, to winter range at the lower elevations, occurs generally in a westerly direction. For mule deer, winter range is represented primarily by sagebrush and mixed shrub habitats, especially where exposure limits snow accumulations. Principal mule deer wintering areas occur to the west of National Forest lands in the Hayden, Craig, and Maybell areas (CDOW, WRIS). Elk winter range extends to higher elevations than mule deer winter range since elk are not as restricted by snow cover as are mule deer. Elk winter range generally occurs below the 8,400-foot elevation level and is typified by oak brush and mixed shrub slopes where exposure limits snow accumulation. The closest elk severe winter range and winter concentration areas are located predominantly below the 7,600-foot elevation level north and south of the Town of Steamboat Springs and adjacent to the Routt National Forest boundary (CDOW, WRIS).

Elk calving or production areas are defined as the portion of the range occupied by cow elk from May 15 to June 15. Elk production areas in the project area region occur in the lower elevation portions of summer range or in ranges that are transitional between winter and summer range. No elk production areas have been identified by the CDOW near the project area, and calving activity would not be expected because of its high elevation location and the lack of suitable habitats (Cedar Creek, 1992c). The closest known production areas are located at the intermediate elevations (7,200

to 9,200 feet) in the Walton, Storm King and Beaver Creek drainages, southwest of the project area and between the Spring Creek and North Fork of Fish Creek drainages, west of the project area (CDOW, WRIS).

Field surveys documented the occurrence of both mule deer and elk in the project area. Tracks and pellets of both species were encountered relatively infrequently along most survey transects and no evidence of elk or mule deer concentration areas was encountered.

3.8.3 Other Mammals

Furbearers and predators potentially occurring in the project area include muskrat, beaver, coyote, red fox, marten, long-tailed weasel, ermine, mink, wolverine, badger, striped skunk, bobcat, and lynx. Wolverine and lynx are federally listed as Candidate (C2) species and are discussed in Section 3.8.9.

Field surveys only documented the presence of coyote and beaver. Due to the secretive nature and nocturnal habits of many of the furbearers, little information on distribution and population densities within the project area is available. Habitat preferences of these species and the potential for their occurrence within the project area are discussed the *Wildlife Technical Memorandum* (Cedar Creek, 1992c).

The marten is a species of interest because it has been selected by many of the National Forests as a Management Indicator Species to represent species using mature and old-growth forest habitats. Martens prefer mature, mesic coniferous or mixed forests with at least a 30 to 50 percent crown density (Koehler et al. 1975, Allen 1982). They avoid large, open areas and clearings, but may use small riparian areas and meadows for foraging (Spencer et al. 1983). Upland meadow and wetland areas represent suitable foraging habitat for the marten, and this species may occur in the project area where these habitats occur, adjacent to mature mixed conifer forest.

A variety of small and medium-sized mammals also occur within the project area. Many of these represent an important food source for raptors and mammalian predators. Field surveys documented the presence of six species of small mammals: least chipmunk, golden-mantled ground squirrel, yellow-bellied marmot, northern pocket gopher, red squirrel, and porcupine. Other potential small mammals inhabitants are listed in the *Wildlife Technical Memorandum* (Cedar Creek, 1992c).

3.8.4 Raptors

Several species of raptors are known to occur and nest within forested habitats in the region of the project area. Three raptors, Cooper's hawk, northern goshawk, and red-tailed hawk, were documented in the project area during the 1992 field period. Other summer or year-long residents in the area include sharp-shinned hawk, golden eagle, American kestrel, great horned owl, northern pygmy owl, long-eared owl, boreal owl, and northern saw-whet owl (Cedar Creek, 1992c). Suitable nesting habitat is present on or near the project area for all these species, but no nest sites or evidence of nesting activity of any raptor species were located during the 1992 field period. Habitat preferences for nest sites of these species are discussed in the *Wildlife Technical Memorandum* (Cedar Creek, 1992c). The northern goshawk is federally listed as a Candidate (C2) species and is discussed in greater detail in Section 3.8.9.

3.8.5 Waterbirds and Upland Gamebirds

Waterbirds include waterfowl, shorebirds, and other wading birds typically associated with wetlands and bodies of surface water. In the project area, surface water is present along small mountain streams, in shallow depressions in upland meadows, and at Fish Creek Reservoir. High elevation in combination with the general lack of shallow-water shoreline areas, and emergent vegetation around water bodies, favored by many species of waterfowl and shorebirds, limits waterbird use of the project area. Spotted sandpiper, common snipe, and California gull were the only waterbirds observed in the project area during the 1992 field period. Most waterbird use of the project area is expected to be by spring and fall migrants, preferring the open water habitat of Fish Creek Reservoir and Puppy Dog Lake. Some use of the perimeter of Puppy Dog Lake and the creeks and associated narrow bands of wetland habitats by puddle ducks (such as mallard and teal), spotted sandpiper, and killdeer for resting, feeding, or nesting is expected.

The only upland gamebirds expected in the project area are blue grouse and mourning dove. Blue grouse occur as year-long residents within the Routt National Forest, while the mourning dove is present only as a summer resident. Blue grouse prefer open areas of conifers or aspen with an understory of shrubs or stands of mixed shrubs with adjacent conifers or aspens. Blue grouse generally are found near a source of water or succulent vegetation and are most likely to occur near the edges of mixed conifer and meadow habitats within the project area. Mourning dove occur in a variety of habitats but prefer agricultural and riparian areas supporting seed producing forbs and grasses near water. This species is not common within the project area. No observations of mourning dove or blue grouse were recorded during the 1992 field period.

3.8.6 Other Avifauna

A variety of songbird and similar species, associated primarily with high elevation coniferous forest and meadow habitats, reside within the project area. Most occur as migrants or summer residents, and only a few species remain in the region during the winter months. Many of the woodpeckers, jays, chickadees, nuthatches, and finches are year-round residents, while the majority of the songbirds migrate south or to lower elevations for the winter months. Songbird and similar species observed during the 1992 field surveys, or potentially occurring within the project area, are listed in the *Wildlife Technical Memorandum* (Cedar Creek, 1992c). Species observed within the project area during the 1992 field period, included 25 songbirds, one hummingbird, and two woodpecker species.

3.8.7 Reptiles and Amphibians

The diversity of amphibians and reptiles in the vicinity of the project area is limited by high elevations and a relatively short, frost-free season. Potential reptilian residents in the project area include: short-horned lizard, western smooth green snake, and wandering garter snake. Potential amphibian residents in the project area include tiger salamander, boreal toad, boreal chorus frog, wood frog, and northern leopard frog. The boreal toad is a federally listed Candidate (C2) species, while the wood frog is listed by Colorado as Threatened. Both species are discussed in Section 3.8.9 The other amphibian species occur in a variety of habitats, but all require permanent or intermittent sources of surface water for breeding. Boreal chorus frog was the only amphibian or reptile observed within the project area during the 1992 field surveys.

3.8.8 Fish

Aquatic habitat within the project area is present in Fish Creek Reservoir, Puppy Dog Lake, small tributary streams to Fish Creek Reservoir, and small pools that have formed in shallow depressions in moist meadow areas. Suitable habitat for cold-water fish species is present in Fish Creek Reservoir, Puppy Dog Lake, the outlet stream from Puppy Dog Lake, Middle Fork Fish Creek and Granite Creek which feed Fish Creek Reservoir, and Middle Fork Fish Creek downstream of the reservoir.

Fish Creek Reservoir is formed by an earth and rock dam approximately 55 feet high and 650 feet in length. Total surface area of the lake is approximately 90 acres, and its maximum depth is approximately 53 feet. Shoal areas comprise 15 percent of the reservoir, and the predominant bottom types are rock and gravel. Fluctuating water levels and regular drainings for maintenance have limited the development of shoreline emergent vegetation.

Rainbow trout were stocked in Fish Creek Reservoir from 1961 until 1984, while brook trout have been stocked since 1986 (Sealing, 1992). Small numbers of rainbow trout remain in the reservoir, but brook trout are the principal sport fish. The brook trout fishery is considered self-sustaining, but occasional drainings for reservoir maintenance limit the viability of this fishery. Suitable trout spawning habitat exists in the reservoir at the outlet to Puppy Dog Lake and in the inlet streams. Brook trout were observed in Fish Creek Reservoir, Puppy Dog Lake, and Granite Creek during the 1992 survey period.

Flow from the Fish Creek Reservoir spillway is routed into Puppy Dog Lake on the north side of Fish Creek Reservoir. Water flow from Puppy Dog Lake exits from the northwest corner of the lake and proceeds down the outlet stream channel approximately one mile before entering the Middle Fork Fish Creek below Fish Creek Reservoir. Spring high-flow releases of water from the Fish Creek Reservoir spillway have resulted in channel erosion in the outlet stream channel from Puppy Dog Lake.

Puppy Dog Lake is shallow meadow type lake with a total surface area of approximately 6 acres. The perimeter of Puppy Dog Lake exhibits a shallow gradient, and the shallow water shoreline areas support extensive stands of emergent vegetation composed primarily of sedges.

As indicated previously, Middle Fork Fish Creek and Granite Creek feed Fish Creek Reservoir. Portions of these creeks above the reservoir would be inundated by reservoir expansion. An evaluation of these streams by the CDOW was completed in August 1992 (Skinner, 1992). The reach of Middle Fork Fish Creek within the potential inundation area is a very steep, step-pool stream type. No fish were observed in this section of stream, and fish habitat was rated as poor because of its steep gradient. Above the inundation area, the stream gradient is less steep, and several brook trout (5 to 7 inches in length) were noted in the plunge pools in this section of the stream. The reach of Granite Creek, within the potential inundation area, is a mountain meadow type stream with a much shallower gradient than that of Middle Fork Fish Creek. Brook trout habitat in this stream reach is considered high quality. Brook trout, observed in Granite Creek, were numerous but small (most were less than 5 inches in length).

3.8.9 Threatened, Endangered, and Candidate Species

No identified critical habitat for any state or federally listed threatened or endangered species has been identified within or near the Fish Creek Reservoir project area. Table 3-23, Threatened, Endangered, and Candidate Species, lists Federal and State Threatened, Endangered, and Candidate species potentially occurring near the project area.

TABLE 3-23
THREATENED, ENDANGERED, AND CANDIDATE SPECIES
POTENTIALLY OCCURRING NEAR THE PROJECT AREA

Common Name	Scientific Name	Status[1]
MAMMALS		
Wolverine	*Gulo gulo*	C2, EC
Lynx	*Felis lynx*	C2, EC
BIRDS		
Bald eagle	*Haliaeetus leucocephalus*	E, EC
American peregrine falcon	*Falco peregrinus anatum*	E, EC
Northern goshawk	*Accipiter gentilis*	C2
AMPHIBIANS AND REPTILES		
Boreal toad	*Bufo boreas boreas*	C2
Wood frog	*Rana sylvatica*	TC
FISH		
Colorado River cutthroat	*Oncorhynchus clarki pleuriticus*	C2

[1]Status:
- E – Listed Endangered by the U.S. Fish and Wildlife Service under the Endangered Species Act. Species which are in imminent jeopardy of extinction.
- C2 – Category 2 Candidate as listed by the U.S. Fish and Wildlife Service under the Endangered Species Act. Species being considered for listing as Threatened or Endangered pending more information.
- EC – Listed by the Colorado Division of Wildlife as endangered in Colorado. A species in immediate jeopardy of becoming extinct throughout all or a significant portion of its range.
- TC – Listed by the Colorado Division of Wildlife as threatened in Colorado. A species not in immediate jeopardy of extinction but is vulnerable because it exists in small numbers or is so restricted throughout all or a significant portion of its range that it may become endangered.

Information on the habitat preferences and known distribution of each listed species is provided in the following sections.

Four state and federal listed endangered species (Colorado squawfish, humpback chub, and bonytail and razorback sucker) occur within the Colorado River drainage downstream of the study area. These listed species do not occur within or near the study area, but alterations in water management within the study area could affect their downstream habitats in the Colorado River drainage system.

Wolverine (C2) - Wolverines prefer rugged, relatively inaccessible mountainous areas at the high elevations in the summer and move to lower (but still snow-bound) elevations in the winter (Hornocker and Hash, 1981). They occur in low densities in large roadless or isolated areas. Wolverines are adapted for carrion feeding and take their food from carcasses of large animals such as elk and deer (Hornocker and Hash, 1981). Wolverines also kill smaller prey such as snowshoe hare, marmot, and small rodents. The scavenging lifestyle of wolverines results in seasonally long movements and relatively large home ranges (Hornocker and Hash, 1981). Suitable habitat for wolverine is present in or near the project area, and it may occur within the range of a wolverine.

Scattered unconfirmed sightings of wolverine have been recorded in the Zirkels, with the closest to the project area being a 1973 observation near Buffalo Pass, and a 1982 observation near Rabbit Ears Pass (CDOW Fisher, Lynx, & Wolverine Database records, provided by G. Byrne, 1992). Additional unconfirmed reports of wolverine have been made in the mountains around North Park to the east of the project area (Torres et al., 1978; CDOW Fisher, Lynx, & Wolverine Database records). The only recent confirmed record of wolverine in the state is a sighting near the East Fork Cimarron River in southwest Gunnison County (CDOW, WRIS).

Lynx (C2) - Historically, the lynx was found at the higher elevations through the central portion of Colorado, although it was never abundant (Torres et al., 1978). Lynx habitat is generally described as climax boreal forest with a dense undercover of thickets and windfalls (DeStefano, 1987). Advanced successional stages of forests and dense conifer stands often are preferred habitats of lynx, especially where areas of rock outcrop, bogs, or thickets are present (McCord and Cardoza, 1982). Primary prey of the lynx in North America is the snowshoe hare, especially during the winter months. During the summer, grouse and small mammal species also are taken, but snowshoe hares are typically still the lynx's main prey (Tumlison, 1987). Suitable lynx habitat exists near the project area, but no confirmed or unconfirmed sightings of this species have been recorded for Routt or nearby Jackson County (CDOW WRIS; CDOW, Fisher, Lynx, & Wolverine Database records). Lynx occurrence has been documented in Clear Creek, Eagle, Lake, and Pitkin counties (CDOW, WRIS). The most recent sightings of lynx are from the Vail area in Eagle County and the Empire area in Clear Creek County (Torres et al., 1978).

Bald Eagle (Endangered, Federal and Colorado) - Bald eagles occur primarily as wintering birds in Colorado, and wintering populations are known to occur along the Yampa and Colorado rivers. A few nesting records also exist for the state. Habitat for bald eagles consists of secure nesting sites, diurnal perches, winter roosts, and foraging areas usually associated with large lakes or rivers. Nesting habitats preferred by bald eagles are multi-layered, mature or old-growth forest stands removed from human disturbance and in shoreline areas adjacent to open water. Important stand characteristics include large trees and snags which provide sites for nests and perches. Preferred bald eagle nesting, foraging, or wintering habitat does not exist on or near the project area, and this species would only be expected as an occasional winter wanderer near the project area.

American Peregrine Falcon (Endangered, Federal and Colorado) - American and Arctic peregrine falcons are known to occur throughout the region primarily during spring and fall migration. The project area occurs within the nesting range of the American peregrine falcon. The peregrine's preferred nest site is a rugged, remote cliff (100 to 300 feet in height) usually overlooking water or marshy areas, where prey is abundant (U.S. Fish and Wildlife Service, 1984). Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes which attract abundant bird life. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas (U.S. Fish and Wildlife Service, 1984), and may occasionally wander over the project area.. Preferred nesting habitat does not exist on or near the project area, and there are no known peregrine falcon nest sites in the vicinity. The closest potential peregrine falcon nesting habitat occurs in North Park to the east of the project area (Torres et al., 1978).

Northern Goshawk (C2) - In Colorado northern goshawks nest in dense coniferous forest, often on north slopes and near water. Nesting also has been documented in aspen trees and in trees in riparian habitats at the lower elevations (Bailey and Niedrach, 1965). Old-growth forest habitats with a relatively open understory are preferred (Hayward et al., 1990), and the goshawk has been identified by the Routt National Forest as an indicator species for late succession habitats. Nests are typically constructed in an upper crotch of a conifer near the trunk and below the canopy top. Nesting birds are relatively intolerant of human disturbance. One observation of an adult northern

goshawk was recorded during the 1992 field period. This bird was noted in flight near the edge of upland meadow and mixed conifer habitat. No nests or evidence of goshawk nesting activity (pluck sites, whitewash, or pellets) were observed in the project area.

Boreal Toad (C2) - The boreal toad occurs in the mountainous portions of Colorado and is most common between 8,500 and 11,000 feet in elevation (Hammerson, 1986). Preferred habitats in Colorado include wet meadows, marshes, and the margins of beaver ponds and lakes (Hammerson, 1986). Boreal toads breed in any body of water lacking a strong current and with gradually descending banks at some point around the perimeter (Burger and Bragg, 1947, as cited in Hammerson, 1986). The primary requirement for breeding apparently is the presence of shallow water (< 1 foot) (Campbell, 1972).

Boreal toads are known to occur at the higher elevations in Routt County (CDOW, WRIS), and boreal toad tadpoles have been found in shallow pools near Rabbit Ears Pass (Brattstrom, 1962, as cited in Hammerson, 1986). Shallow ponds in upland meadow habitat, the margins of Puppy Dog Lake, and beaver ponds associated with the feeder streams to Fish Creek Reservoir, represent suitable breeding habitat for boreal toad within the project area. Nighttime searches in wetland habitat and around ponds during the 1992 survey period (July 29 - August 1) did not locate any boreal toads. Boreal chorus frog was the only amphibian located within the project area (Cedar Creek, 1992c).

Wood Frog (Threatened, Colorado) - Although widespread throughout much of Alaska, Canada, and the northeastern United States, the wood frogs distribution is disjunct in Colorado and is limited to the upper tributaries of the Colorado River and the Laramie River around the margins of North Park (Hammerson, 1986). Occupied habitats include marshes, bogs, wet meadows, beaver ponds, lakes, stream borders, and moist willow thickets between 8,000 and 11,000 feet in elevation (Hammerson, 1986; CDOW, 1989). Shallow, natural ponds supporting extensive growth of sedges in shallow water areas and lacking a permanent inlet or outlet are preferred for breeding. Trout prey on wood frog larvae, and the presence of trout usually prevents successful wood frog reproduction (Hammerson, 1986). Wood frogs are rarely found in habitats occupied by trout or other amphibians (CDOW, 1989).

Shallow ponds in upland meadow habitat represent suitable breeding habitat for wood frog within the study area. The margins of Puppy Dog Lake are not expected to support wood frogs because of the presence of trout. Nighttime searches in wetland habitat and around ponds during the 1992 survey period did not locate any wood frogs.

Colorado River Cutthroat (C2) - The Colorado River cutthroat is native to the Colorado River drainage. Fishing pressure and competition with non-native species such as brook and rainbow trout have eliminated the Colorado River cutthroat from most of its original range. Its current distribution is limited to a few small headwater streams and lakes in northwest Colorado. The Colorado River cutthroat currently does not occur within the waters of the study area, but suitable habitat is present.

3.9 RECREATION

3.9.1 Introduction

The information and data used to prepare the following discussion was obtained through field visits to the study areas, interviews with the Forest Service, and by reviewing maps. The results of this analysis are presented in detail in the document *Recreation Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992d), which was submitted to the Forest Service in support of this

EIS. For the purpose of the recreation discipline, two study areas were delineated. As shown in Figure 3-25, Recreation Primary Study Area, and Figure 3-26, Existing Developed Recreation Facilities, the primary study area consists of Fish Creek Reservoir and its immediate surroundings, while the secondary study area encompasses portions of the Routt National Forest surrounding Fish Creek Reservoir that could be indirectly impacted by the proposed project.

3.9.2 The Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is an inventory process used by the Forest Service that categorizes the recreational resources on a forest. The ROS system assures that recreation is integrated into the overall land and resource management planning process. A ROS map for the primary and secondary study areas is presented in Figure 3-27, Recreation Opportunity Spectrum. All of the campgrounds, picnic sites, and roads within the primary and secondary study areas are located in areas designated as "Roaded Natural" recreation opportunities. This designation means that recreation opportunities are provided in a natural-appearing environment in which developed structures exist but are designed in such a manner that high visual quality is maintained. Access and travel is by sedan and trailer, recreation vehicle, or motor home, via sensitive roads and trails.

The majority of the secondary study area also includes land that is designated "Semi-Primitive, Non-Motorized" during the summer, but "Semi-Primitive Motorized" during the winter. In these areas, recreation takes place in a natural-appearing environment in which only a limited amount of on-site facilities exist. During the summer, access is restricted to non-motorized travel but during the winter, snowmobiling is allowed.

A "Primitive" area exists in portions of the forest to the west and to the south of Long Lake. In this area, recreation opportunities are offered in a natural-appearing environment in which no on-site facilities exist, little interaction between visitors occur, and access is restricted to non-motorized travel.

3.9.3 Recreational Resources

Figure 3-26 shows the location of recreation facilities within the primary and secondary study areas. Located on the eastern shore of Fish Creek Reservoir, Granite Campground is the only developed facility within the primary study area. Open during the summer months only due to early and late snow cover, the Forest Service campground is a non-fee, walk-in campground with four campsites and one vault toilet which presently is not operational. The facilities also include a small parking lot, dispersed picnic tables, and a gravel boat ramp. In addition, a limited amount of dispersed camping sites can be found along a user-created trail that circles the reservoir. Because Fish Creek Reservoir has only a limited amount of developed facilities, the reservoir provides a rather pristine and uncrowded recreation setting, even when the campground is full. Although use is typically concentrated on the weekends, the campground's low user capacity (approximately 25 persons at one time) and seasonally limited access protects the nature of the recreation setting.

Recreation facilities, located in the secondary study area, include five campgrounds that provide a total of 62 campsites. Operated by the Forest Service, these campgrounds consist of Dry Lake Campground, Summit Lake Campground, Teal Lake Campground, Grizzly Creek Campground, and Hidden Lakes Campground. All of these campgrounds are closed during the winter, due to snowfall. Summit Lake Campground is centrally located at the top of Buffalo Pass and thus acts as a "hub" for a variety of recreation opportunities. There are sixteen campsites and two large parking lots that accommodate people visiting the Mount Zirkel Wilderness, Fish Creek Reservoir, Long Lake, the Wyoming Trail, or Summit Lake. Dry Lake Campground is the smallest and most primitive of the

five campgrounds, and is located on the west side of Buffalo Pass along FDR 60. Grizzly Creek, Teal Lake, and Hidden Lakes Campgrounds are all fee areas and are located on the eastern edge of the secondary study area. Also found within the secondary study area is Fish Creek Falls Recreation Area. Operated by the Forest Service, this facility is located at the end of FDR 320, just outside of Steamboat Springs, and contains a parking area, four picnic sites, and viewing areas of the falls. Unlike the other facilities in the study area, Fish Creek Falls Recreation Area is open during the winter.

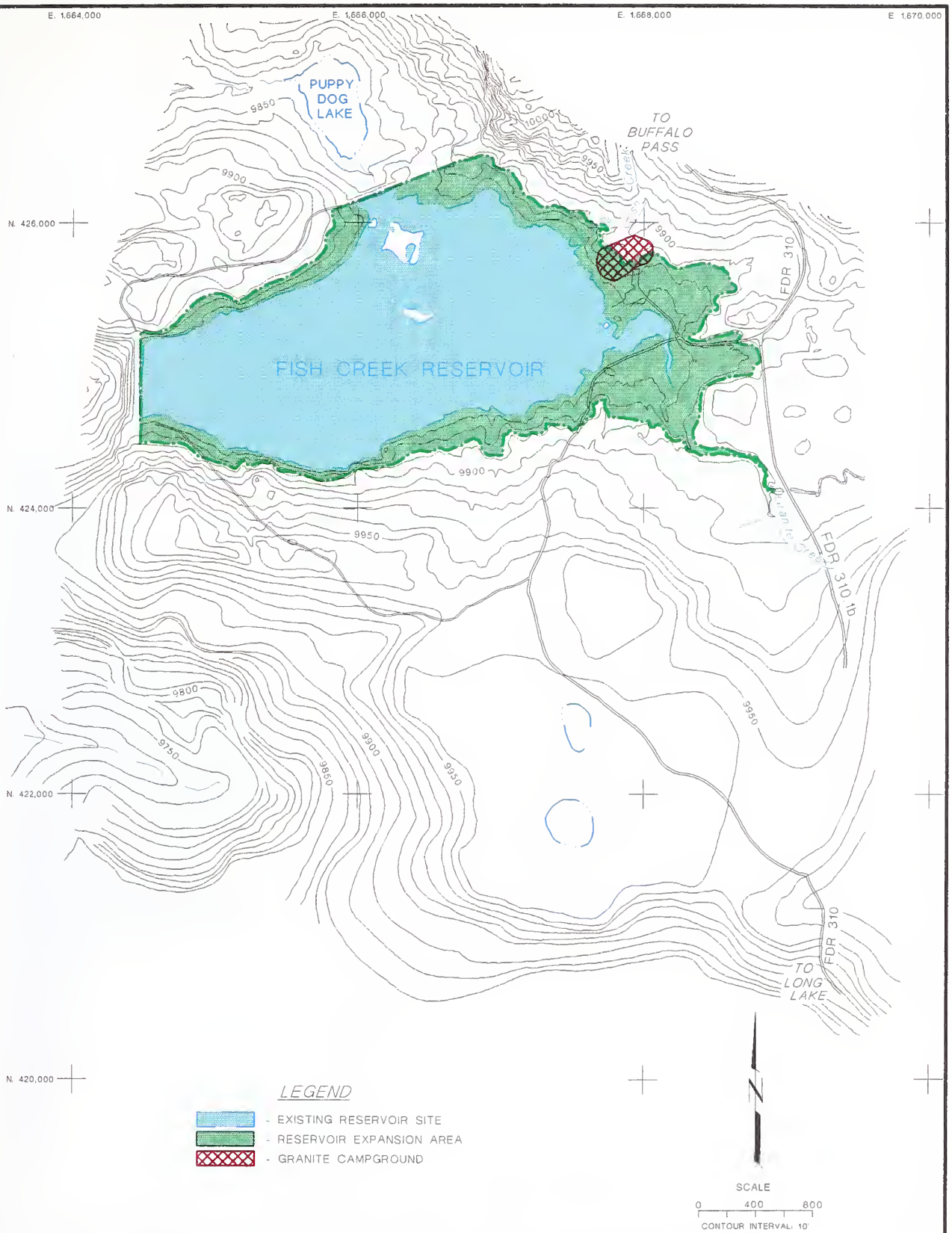
There are four main trails located within the secondary study area. Trail #1101, also called the Wyoming Trail, or the Continental Divide Trail, begins approximately one mile south of Summit Lake, along FDR 310, and follows the Continental Divide south. Trail #1102 begins at Fish Creek Falls and continues east to Long Lake, where it meets with Trail #1134, which continues east to FDR 20. All three of these trails are maintained by the Forest Service. The Spring Creek Trail is a popular hiking and mountain biking trail that connects Steamboat Springs with Buffalo Pass Road (FDR 60). This trail is currently not maintained by the Forest Service.

3.9.4 Recreational Activities

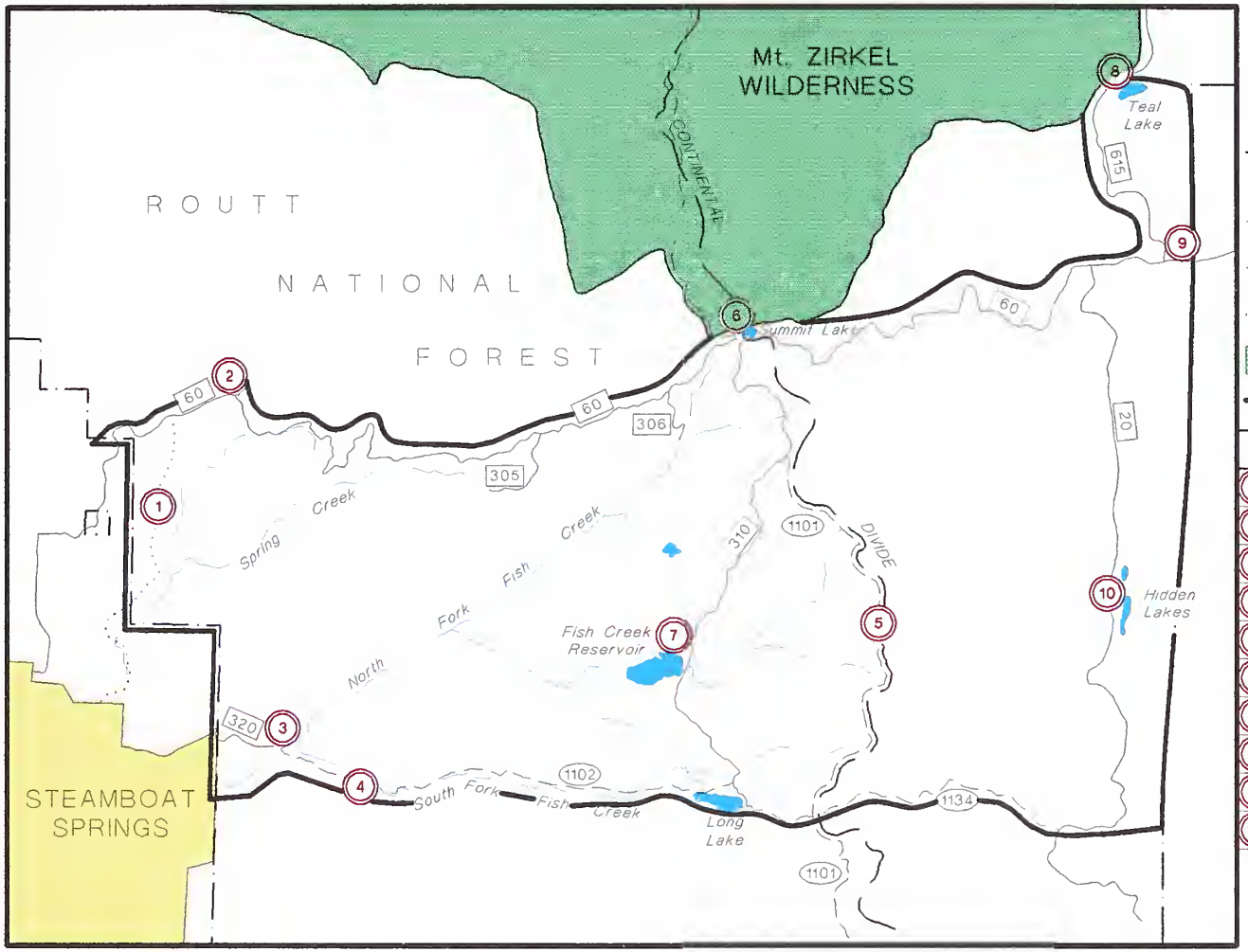
The most common activities that occur at Fish Creek Reservoir are camping, picnicking, and fishing. Generally, the reservoir receives its greatest use on the weekends and holidays, and lower use on the weekdays. Granite Campground records approximately 1,000 Recreation Visitor Days (RVD's) per year (Recreation and Travel Management Report, 1992). Dispersed camping in non-developed sites is most common during the hunting seasons in October and November, but occurs occasionally throughout the summer. Fishing is the most popular type of dispersed recreation activity that takes place at the reservoir. The Colorado Division of Wildlife stocks the reservoir with brook trout. Fishing often occurs along the banks of the reservoir, from float tubes and from non-motorized boats. Other dispersed forms of recreation that take place in the primary study area include picnicking, hiking, and mountain biking. In the winter, snowmobilers and backcountry skiers are able to access the reservoir, but exact use patterns are not known.

Because the secondary study area is quite expansive, and contains a considerably larger amount of developed facilities, it accommodates many more visitors per year than the primary study area. As with the primary study area, recreational use in the secondary study area is typically concentrated on the weekends and holidays. Estimated annual RVD's for each campground in the secondary study area are presented in Table 3-24, Estimated Annual Recreation Visitor Days. The total RVD's for all of the campgrounds is estimated at 18,600 per year. Fish Creek Falls Recreation Area typically records 12,500 to 15,000 RVD's annually (Forest Service Capital Investment Project Proposal, 1991).

Hiking, mountain biking, camping, horseback riding, and fishing are the most common activities occurring in the secondary study area. Mountain biking is a rapidly growing sport and has become very popular along Buffalo Pass. Fish Creek Falls Trail (#1102), the Spring Creek Trail, FDR 60, and FDR 310 are the most commonly used routes, accommodating beginner, intermediate, and expert riders. Use conflicts have begun to occur, however, between mountain bikers and hikers using the Fish Creek Falls Trail. Camping and fishing are popular in both developed and dispersed recreation sites. Most of the forest, except FDR 310, is open to vehicle travel for up to 300 feet off designated roads and trails, for the purpose of dispersed camping and firewood collection *(Recreation and Travel Management Report, 1992).* Summit Lake, Teal Lake, and Hidden Lakes are stocked by the Colorado Division of Wildlife and are heavily fished. Dinosaur Lake, although it is not stocked



Project No.: 828-1500	Design By: L. LABOVITCH	Scale: SEE SCALE BAR	FISH CREEK RESERVOIR EIS
File: FC3PSA.DWG	Drawn By: T. CLARK	Date: August 1993	**RECREATION PRIMARY STUDY AREA**
FIGURE 3-25			



LEGEND

- ROUTT NATIONAL FOREST BOUNDARY
- TRAIL
- ROAD
- MOUNTAIN BIKE TRAIL
- Mt. ZIRKEL WILDERNESS
- SECONDARY STUDY AREA

RECREATION SITE	FACILITIES
1 × SPRING CREEK MOUNTAIN BIKE TRAIL	MOUNTAIN BIKE TRAIL
2 DRY LAKE CAMPGROUND	CAMPSITES (8)
3 FISH CREEK FALLS PICNIC GROUND	PICNIC SITES (4) HIKING TRAIL VIEWPOINT
4 FISH CREEK FALLS TRAIL - No. 1102	HIKING TRAIL
5 WYOMING TRAIL No. 1101	HIKING TRAIL
6 SUMMIT LAKE CAMPGROUND	CAMPSITES (16) FISHING HIKING TRAILS
7 GRANITE CAMPGROUND	CAMPSITES (4) FISHING HIKING TRAILS
8 TEAL LAKE CAMPGROUND	CAMPSITES (17) FISHING HIKING TRAILS
9 GRIZZLY CREEK CAMPGROUND	CAMPSITES (12)
10 HIDDEN LAKES CAMPGROUND	CAMPSITES (9) FISHING

× NOT MAINTAINED BY U.S.F.S.

SOURCE: U.S.F.S - FOREST SERVICE-ROUTT NATIONAL FOREST.

N

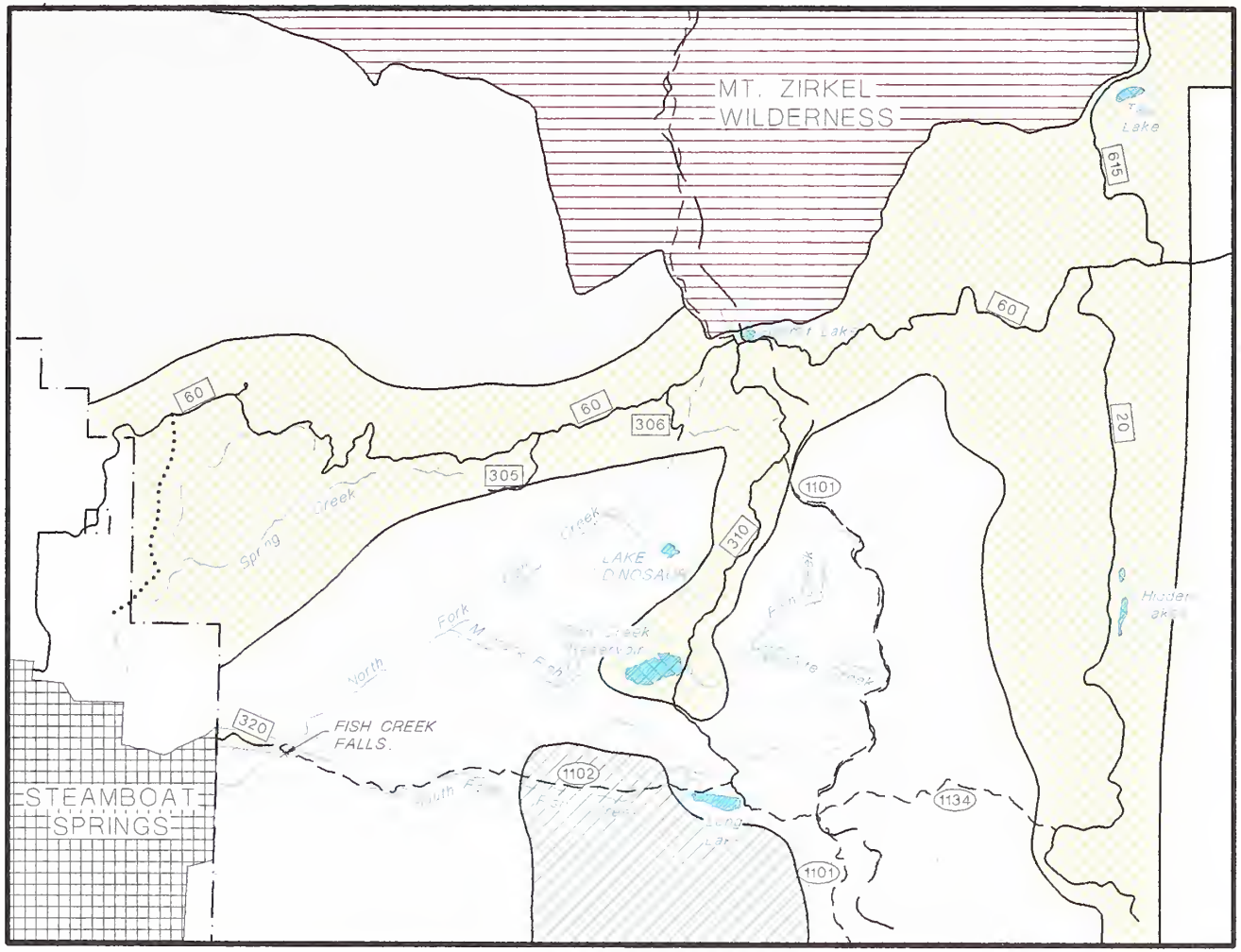
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Project No.: 828-1500	Design By: L. LABOVITCH	Scale: SEE BAR SCALE
File: FC3EXR.DWG	Drawn By: T. SMITH	Date: August 1993

FIGURE 3-26

FISH CREEK RESERVOIR EIS

EXISTING DEVELOPED RECREATION FACILITIES



LEGEND

- SEMI-PRIMITIVE NON-MOTORIZED
  NOTE: WINTER USE IN THIS AREA CHANGES TO SEMI-PRIMITIVE MOTORIZED
- SEMI-PRIMITIVE MOTORIZED
- ROADED NATURAL
- PRIMITIVE
- Mt. ZIRKEL WILDERNESS
- ROUTT NATIONAL FOREST BOUNDARY
- TRAIL
- ROAD
- MOUNTAIN BIKE TRAIL

USDA FOREST SERVICE, ROUTT NATL. FOREST, NORTH PARK DISTRICT. AUGUST, 1992.

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828-1500	L. LABOVITCH	SEE BAR SCALE
File:	Drawn By:	Date:
FC3ROS.DWG	T. SMITH	August 1993

FIGURE 3-27

FISH CREEK RESERVOIR EIS

RECREATION OPPORTUNITY SPECTRUM

and is not accessible by maintained trails, is also fished occasionally. Hiking and horseback riding are also very popular and occur frequently along designated trails throughout the secondary study area.

TABLE 3-24
ESTIMATED ANNUAL RECREATION VISITOR DAYS (RVD's) FOR CAMPGROUNDS IN THE SECONDARY STUDY AREA

CAMPGROUND	NUMBER OF CAMPSITES	ESTIMATED RVD's
Dry Lake Campground	8	2,400
Summit Lake Campground	16	4,800
Grizzly Creek Campground	12	3,600
Hidden Lakes Campground	9	2,700
Teal Lake Campground	17	5,100

NOTES: (1) Calculations based on the following assumptions:
60 percent occupancy rate
5 visitors per campsite
100 day use season
SOURCE: Schmitzer, Rob. Personal Communication. USDA Forest Service, Routt National Forest, Hahns Peak District Ranger Office. September, 1992.

During the winter, snowmobiling and backcountry skiing are very popular in the secondary study area. Steamboat Powdercats, a commercial ski operation that operates under a Forest Service special use permit, makes alpine skiing available along Buffalo Mountain, on the west side of Buffalo Pass. Cross-country and telemark skiing take place throughout the secondary study area, although no official trail system has been established. Snowmobiling is legal in most parts of the forest, except in wilderness areas (including the Mount Zirkel Wilderness), Steamboat Ski Area, and in elk winter ranges, and is enjoyed frequently by enthusiasts.

The Forest Service feels that many of the developed facilities in the secondary study area, particularly trails and campgrounds, are being overused in the summer. Dispersed recreation is not as significant of a problem, but the current demand for developed recreational opportunities, especially on the weekends, is often greater than the available supply of facilities. During the winter, overcrowding occurs at the Buffalo Pass Road Winter Trailhead at Dry Lake during weekends and other high use days.

3.9.5 Future Recreational Use/Development

In the future, recreational use of the Routt National Forest is expected to increase. The main factors involved in this increase are: 1) the main access road into the Buffalo Pass area (FDR 60) is scheduled to be upgraded and will allow a wider variety of vehicles to get to selected recreation sites along the Buffalo Pass corridor; 2) current marketing strategies for Steamboat Springs have attracted more summer visitors to the area, and have broadened the summer tourist season; and 3) due to the proximity of the Routt National Forest to Steamboat Springs, expected population increases in Steamboat Springs will have a direct impact on visitor numbers in the Buffalo Pass area. Because recreational use in this area is already high, however, proposals are being made by the Forest Service to upgrade areas which typically see heavy use, and to better disperse visitors throughout the Routt National Forest. These plans include the expansion and upgrading of campgrounds, construction of new trails, an increase in available parking, and the upgrading of roads.

As part of the Forest Service plans, Dry Lake Campground would be expanded and Summit Lake Campground and Fish Creek Falls Recreation Area would be upgraded. Twenty new campsites

(including vehicle pull-through sites), a new water system, and composting toilets, would be built at Dry Lake Campground. Dry Lake trailhead was constructed in the summer of 1992, for use during summer and winter recreation seasons. The Forest Service also plans to pave the campground's roads and rehabilitate the existing campsites. At Summit Lake Campground, the Forest Service proposes to enlarge parking facilities, install a new water system and composting toilets, landscape trailheads, and upgrade the existing campsites, picnic areas, and trails. At the Fish Creek Falls Recreation Area, reconstruction of the trails and facilities is scheduled for 1995 and Fish Creek Falls Road is scheduled to be paved in 1994 (AGO, 1991). In addition, plans to upgrade and expand Granite Campground are being developed as proposed mitigation to the Proposed Action.

A number of new trails and trailheads have also been proposed by the Forest Service. The Forest Service plans to enlarge the parking area at the end of FDR 310 near Fish Creek Reservoir and install a formal sign that identifies the trail that continues from the reservoir to Long Lake. There are also plans to reestablish a loop trail that once connected Dinosaur Lake with FDR 310. Although this trail currently sees limited use, it is not included in the Forest Service trail system, due to its poor condition. Future plans involve rehabilitating the trail, constructing a trailhead along FDR 310, and providing a parking area.

There are also plans to improve the Spring Creek Trail. In order to resolve current conflicts with private land owners, the Forest Service proposes to re-route this trail around the private property through which it currently passes. In so doing, the Forest Service could then maintain the trail as part of the Forest Service trail system. The new Spring Creek Trail would likely tie in with the Dry Lake Trailhead.

Construction of the Mountain View Trail, connecting Mt. Werner (the top of the ski area) with Long Lake, is tentatively scheduled for 1996. This trail would be accessible to mountain bikers, hikers, and cross-country skiers. It is also likely that a nordic ski hut system will be analyzed in the near future. This type of trail would allow skiers to travel between Rabbit Ears Pass and Buffalo Pass.

3.10 TRANSPORTATION

3.10.1 Introduction

The information presented in the following discussion was obtained from test drives of the existing transportation routes, interviews with appropriate road agencies (including Jackson County, Routt County, and the Forest Service), and by examining Forest Service topographical maps. Existing transportation routes were assessed under the following categories:

- Location and Ownership
- Road Conditions
- Traffic Loads
- Proximity to Streams
- Road Maintenance

Each of these categories is considered important to the viability of the road system and its ability to support increased traffic as a result of the Proposed Action or project alternatives. A detailed account of the transportation analysis is presented in the *Transportation Baseline Technical Report for the Fish Creek Reservoir Expansion EIS (ACZ, 1992e).*

3.10.2 West Route

3.10.2.1 Location and Ownership

The transportation routes studied for this analysis are shown in Figure 3-28, Transportation Routes. The West Route from Steamboat Springs to Fish Creek Reservoir begins at the junction of Amethyst Drive and Routt County Road (RCR) 36, and proceeds north on RCR 36 to RCR 38. It then continues east 1.7 miles on RCR 38 to the Routt National Forest boundary, where it becomes Forest Development Road (FDR) 60 and continues east 9.1 miles to Buffalo Pass. It then proceeds south on FDR 310 for 4.4 miles to Fish Creek Reservoir. Routt County has jurisdiction over RCR 36 and RCR 38. The Forest Service has jurisdiction over FDR 60 and FDR 310 (Snowden, 1992).

The intersection of Amethyst Drive and RCR 36 can be accessed through the City of Steamboat Springs by two different routes. Both routes begin at the intersection of Lincoln Avenue and 3rd Street and are shown in Figure 3-29, City Access Routes. City Access Route 1 proceeds along paved roads past the Post Office to Fish Creek Falls Road, and then to Amethyst Drive, where it passes through residential neighborhoods and past Strawberry Park Junior High and Elementary Schools. City Access Route 2 proceeds downtown along paved roads to 7th Street, then passes through residential neighborhoods.

3.10.2.2 Road Conditions

The condition of the West Route varies, according to Forest Service definitions, from 'paved' to 'all-weather' to 'dirt' roads. The general road conditions are good at the beginning but drop to fair as you continue along the route. A detailed description of all sections of the West Route is shown in Table 3-25, West Route Road Conditions.

There are several culverts which run underneath the road along the West Route. A number of these culverts have less than one foot of cover. The Forest Service requires that the thickness of cover over a culvert be 2/3 the diameter of the culvert. A minimum diameter of 18 inches is required by the Forest Service for metal culverts.

A dust suppressant and binder (lignon sulfinate) was added to the first half mile of RCR 38 to stabilize the road base and to suppress the dust. According to the County, this has proven to be effective, as this section of the road requires less maintenance than the rest of the road.

According to the Forest Service, the west side of FDR 60 will be upgraded in the near future to be a double-lane asphalt road from RCR 38 to Dry Lake Campground; a single-lane double chip-seal road with turnouts from Dry Lake Campground to the West Summit; and a single-lane gravel road from the West Summit to the top of Buffalo Pass.

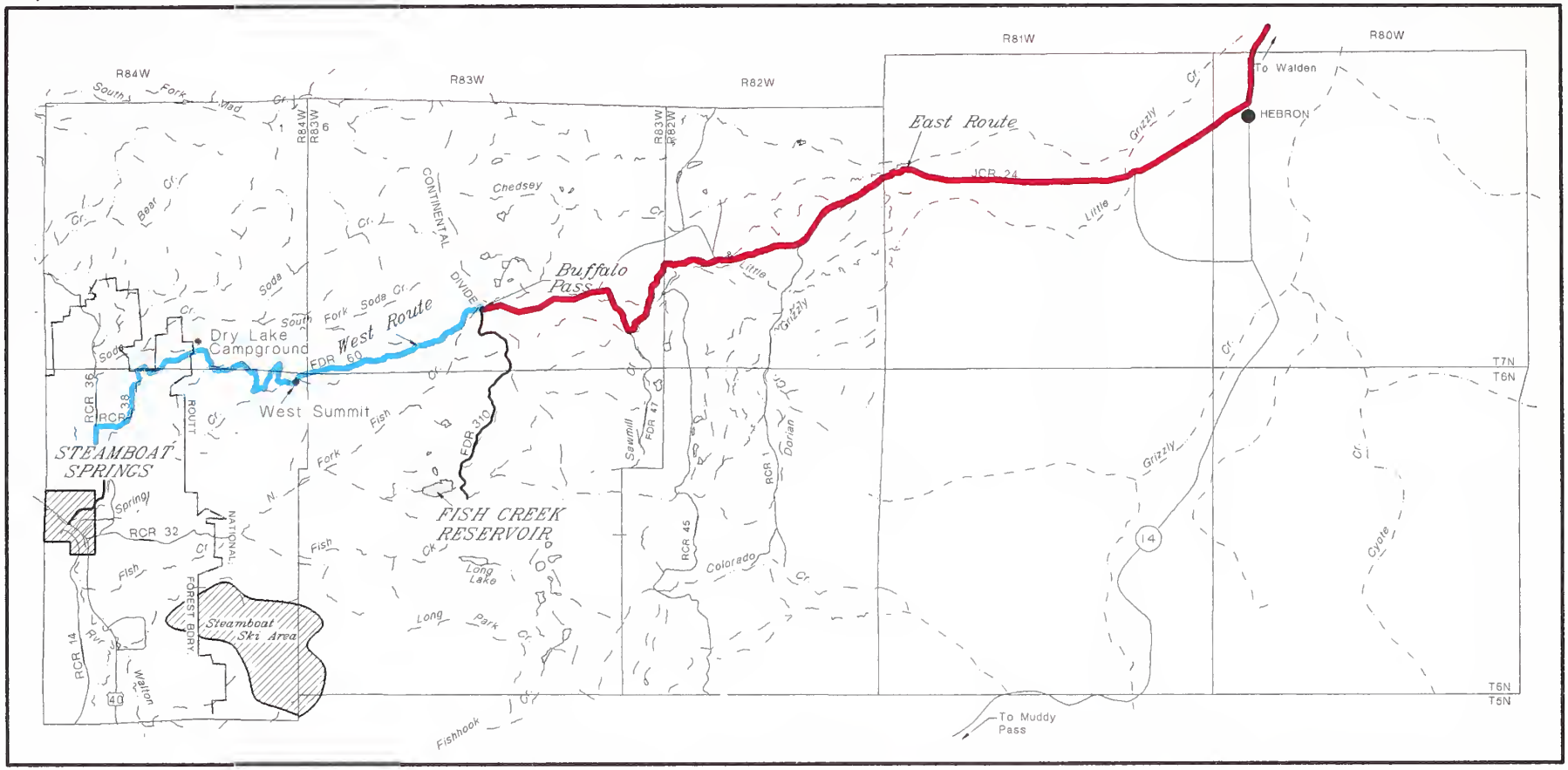
3.10.2.3 Traffic Loads

Traffic counts were conducted on FDR 60 at Dry Lake Campground in 1981, 1988, 1991. The results are shown on Table 3-26, Traffic Counts. As shown in Table 3-26, the average daily traffic (ADT) on the west side of FDR 60 for 1991 was 108 vehicles, with the ADT on the weekends twice that of weekdays. Peak travel times were between 11 am and 6 pm.

TABLE 3-25
WEST ROUTE ROAD CONDITIONS

Section	Road	Length (miles)	Width (feet)	Grade (%) Avg.	Grade (%) Max	Alignment	Surface	Creek Miles (miles)	Comments
RCR 36	RCR 36	1	25	2.5	2.5	Very Good	Pavement	0	
Start of RCR 38 To End of Pavement	RCR 38	0.24	20	0	0	Very Good	Pavement	0	
End of Pavement to Dry Lake Campground	RCR 36/ FDR 60	2.95	25	8	10	Fair	Gravel	1.1	Semi-smooth, well compacted, good drainage
Dry Lake Campground to Buffalo Pass	FDR 60	7.6	15 to 20	5	13	Poor/Fair	Native Material	1.0	Semi-rough, well compacted, some protruding rock, good drainage
Buffalo Pass to Fish Creek Reservoir	FDR 310	4.4	15	2	10	Fair	Native Material/Aggregate	.6	Semi-rough well compacted, some protruding rock, good drainage

Notes: RCR - Routt County Road
FDR - Forest Development Road
Creek Miles - Length of Road Adjacent to Creek



LEGEND

- East Route
- West Route

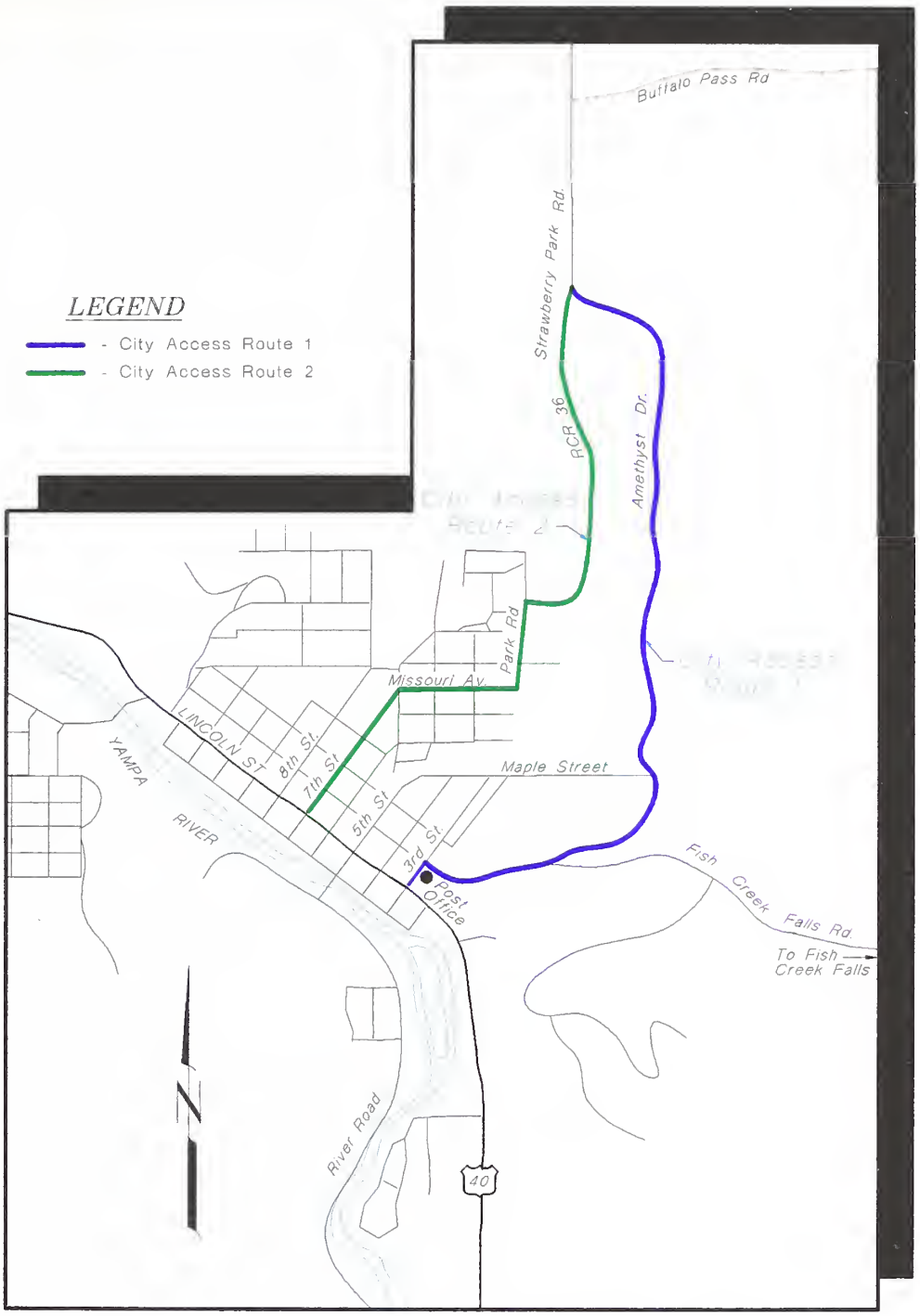
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Project No.: **828-1500**	*Design By:* **T. LEIDICH**	*Scale:* **1"=2 MILES**
File: **FC3TRAN.DWG**	*Drawn By:* **T. CLARK**	*Date:* **August 1993**

FIGURE 3-28

FISH CREEK RESERVOIR EIS

TRANSPORTATION ROUTES



Project No.: 828-1500	Design By: T. LEIDICH	Scale: NO SCALE
File: FC3CITY.DWG	Drawn By: T. CLARK	Date: August 1993

FIGURE 3-29

FISH CREEK RESERVOIR EIS

CITY ACCESS ROUTES

TABLE 3-26
TRAFFIC COUNTS

Year	Route	ADT	ADT		Peak Hours (time)
			Weekend	Weekday	
1981	West	88	NA	NA	NA
1988	West	106	166	83	11 am to 6 pm
1991	West	108	173	83	11 am to 6 pm
1983	East (1)	33	NA	NA	NA
1981	East (1)	29	NA	NA	NA
1983	East (2)	99	NA	NA	NA
1991	East (2)	88	128	73	11 am to 5 pm

Notes: ADT- Average Daily Traffic
(1)- East Route from the intersection with Saw Creek Road west.
(2)- East Route at Grizzly Creek Campground

3.10.2.4 Proximity to Streams

The proximity of roads to perennial and intermittent creeks was analyzed in order to assess the probability of a transportation-related spill, contaminating a stream channel. 'Close proximity' to a stream is defined as any location where a road is within 100 feet of a creek; or if the topography grade is 15 percent or greater, within 250 feet of a creek. It is assumed that, in reaches where the road is within the defined proximity of a stream, a potential spill has a high probability of reaching the creek before cleanup can be completed.

The West Route is in close proximity to several creeks for a total of 2.7 miles of its 15 mile length. Table 3-25 provides information regarding the proximity of the creeks to associated road sections.

3.10.2.5 Road Maintenance

The West Route is maintained by both Routt County and the Forest Service. The gravel portion of RCR 38 and FDR 60 up to Dry Lake Campground is bladed approximately once per week (Gabos, 1992). The remaining part of FDR 60 and FDR 310 are usually bladed twice annually (Snowden, 1992). Snow removal in past years has been performed by Routt County to the parking area at the end of RCR 38. Beginning this year, however, Routt County will perform snow removal up to the Dry Lake Campground. Above Dry Lake Campground, the West Route is closed during the winter, except to snowmobiles and skiers.

3.10.3 East Route

3.10.3.1 Location and Ownership

As shown in Figure 3-28, the East Route begins at the junction of State Highway 14 and Jackson County Road (JCR) 24. The route proceeds down JCR 24 for 10.8 miles to the Grizzly Creek Campground and then proceeds 8.5 miles along FDR 60 to Buffalo Pass where it intersects FDR 310.

It then continues 4.4 miles along FDR 310 to Fish Creek Reservoir. Jackson County has jurisdiction over JCR 24 and the Forest Service, North Park District has jurisdiction over FDR 60 on the east side of the continental divide (Cobb, 1992).

3.10.3.2 Road Conditions

The condition of the East Route varies, according to Forest Service definitions, from 'paved' to 'all-weather' to 'dirt' to 'unimproved' road. The general condition of the East Route is good at the beginning but it deteriorates to poor for 2.75 miles before Buffalo Pass. A detailed description of the all sections of the East Route are shown in Table 3-27, East Route Road Conditions.

There are several culverts along the East Route, a number of which have less than one foot of cover. In addition, there are a number of drainage dips on the 2.75 mile length of road before Buffalo Pass.

According to the Forest Service, the east side of FDR 60 will be upgraded in the near future to a single-lane gravel road with turnouts and two scenic viewing areas (Cobb, 1992).

3.10.3.3 Traffic Loads

Traffic counts were conducted on FDR 60 at Grizzly Creek Campground and at the junction of Sawmill Creek Road in 1983 and 1991. The results of these surveys are presented in on Table 3-26. As shown on Table 3-26, the ADT for the east side of FDR 60 during 1991 was 88 at Grizzly Creek Campground and 29 at the Sawmill Creek Road intersection. Like the west side, the ADT on the weekends was approximately twice that of weekdays. Peak travel time was between 11 am and 5 pm.

3.10.3.4 Proximity to Streams

The East Route is in close proximity to several creeks for a total of 1.7 miles of its 18 mile length. Detailed information on specific sections of the East Route is presented in Table 3-27.

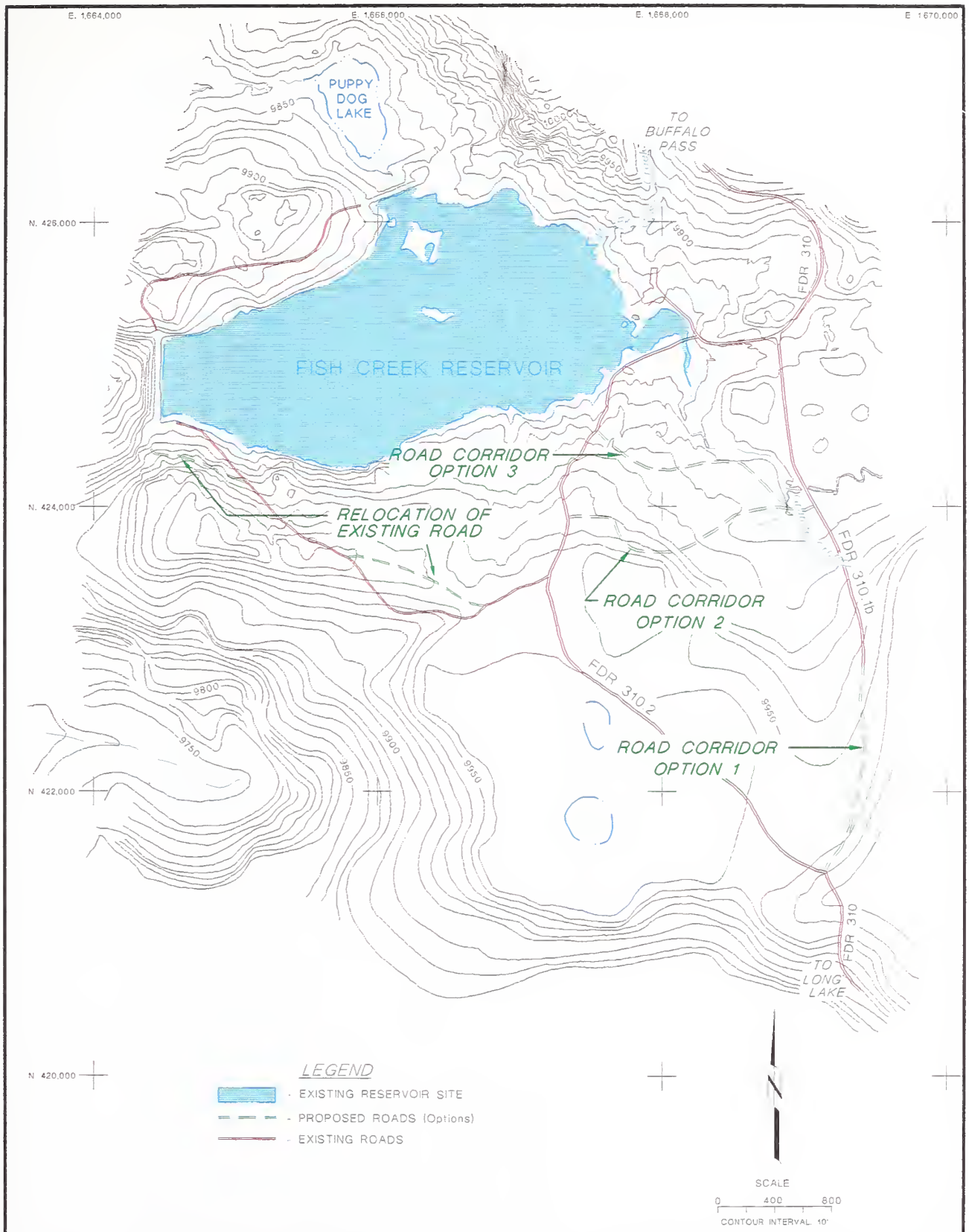
3.10.3.5 Road Maintenance

The East Route is maintained by both Jackson County and the Forest Service. The gravel portion of JCR 24 is bladed 6 to 7 times annually (Gerr, 1992). The east side of FDR 60 is bladed at least once, and sometimes twice, annually (Cobb, 1992). Snow removal up to Sawmill Creek Road is done by Jackson County. FDR 60, beyond the Sawmill Creek Road intersection, is closed during the winter.

3.10.4 On-Site Roads

3.10.4.1 Existing Site Roads

All site roads are shown on Figure 3-30, Site Transportation Plan. Currently, FDR 310 extends past Fish Creek Reservoir to Long Lake, but is closed to public vehicle travel from the reservoir to the lake. Referred to as FDR 310.2, this road is used by the Forest Service and the City to access Long Lake. FDR 310.2 is an improved dirt road which was reconstructed with an aggregate surface approximately five years ago (Schmitzer, R., 1992). It has some steep grades, and is ditched and cross drained with culverts.



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File: FC3ACCS.DWG	Drawn By: T. CLARK	Date: August 1993

FIGURE 3-30

FISH CREEK RESERVOIR EIS

SITE TRANSPORTATION PLAN ALTERNATIVES B & C

TABLE 3-27
EAST ROUTE ROAD CONDITIONS

Section	Road	Length (miles)	Width (feet)	Grade (%)		Alignment	Surface	Creek Miles (miles)	Comments
				Avg.	Max				
Start of JCR 24 To End of Pavement	JCR 24	7.5	30	1.5	15	Good	Pavement	0.7	
End of Pavement to Grizzly Creek Lake Campground	JCR 24	0.24	30	5	10	Good	Gravel	0	Well Maintained, well compacted, good drainage
Grizzly Creek Campground to Junction with Sawmill Creek Road	FDR 60	1.8	15 to 20	6	16	Fair	Native Material	0.3	semi-smooth, well compacted good drainage
Junction with Sawmill Creek Road to Start of Steep Section	FDR 60	1.2	15	12	16	Poor/Fair	Native Material	0.1	Semi-rough, well compacted some protruding rock, good drainage
Start of Steep Section to Buffalo Pass	FDR 60	2.8	10	10	20	Poor	Native Material	0.05	Rough, a lot of rock, poor drainage
Buffalo Pass to Fish Creek Reservoir	FDR 310	4.4	15	2	10	Fair	Native Material	.6	Semi-rough, well compacted some protruding rock, good drainage

Notes: JCR - Jackson County Road
FDR - Forest Development Road
Creek Miles - Length of Road Adjacent to Creek

Approximately 0.5 miles from Fish Creek Reservoir, a double-track four-wheel drive road branches off of FDR 310.2 and continues to the reservoir's dam and saddle dam. This road is very steep with very poor alignment and little drainage. It is also closed to the public.

FDR 310.1B, also a continuation of FDR 310, continues south from Fish Creek Reservoir approximately 0.2 miles to Forest Service Trail #1101.1A. FDR 310.1B is a rough dirt road with good alignment and moderate grades, and is constructed with native material.

3.10.4.2 Road Corridor Options

If the proposed Fish Creek Reservoir expansion is approved, the first quarter mile of FDR 310.2 would be inundated. Three road corridor options have been proposed to route FDR 310.2 around the proposed reservoir. All three of the road options are shown on Figure 3-30. Other proposed plans for the site include the realignment and upgrading of the two-track four-wheel drive road that provides access from FDR 310.2 to the reservoir's dam and saddle dam. The road would be realigned in order to replace the section inundated by the proposed reservoir expansion and to bypass environmentally sensitive meadows. Upgrading would include regrading and the addition of drainage structures and gravel. The sections that would be realigned are also shown on Figure 3-30.

3.11 VISUAL RESOURCES

3.11.1 Introduction

The Fish Creek Reservoir is located two miles west of the Continental Divide, near Buffalo Pass. The 90-acre reservoir is an important aesthetic asset to the Routt National Forest. As discussed in the Recreation Section (Section 3.9), the reservoir is used for many different types of recreation activities. Although access is limited due to the condition of the roads, the reservoir, recreational facilities, and adjacent lands are used for camping, picnicking, boating, hiking, hunting, and fishing. In addition, many people pass by the reservoir along Fish Creek Reservoir Road (FDR 310) on mountain bikes, on foot, or in cars. Due to the limited access, the reservoir and adjacent lands provide a relatively uncrowded, pristine environment for recreation.

The existing visual resources in the project area were analyzed using the Forest Service Visual Resource Management System. This system is described in detail in the *Visual Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992f).

3.11.2 Project Site Visibility

The proposed expansion would only be seen from within the immediate vicinity of the reservoir. The hills and ridgelines enclosing the Middle Fork Fish Creek basin would obscure the site from much of the adjacent forest. The project site would not be visible from the following areas:

- Fish Creek Falls Recreation Area
- Fish Creek Trail
- Buffalo Pass
- Mt. Werner

Additionally, Fish Creek Falls, located on the South Fork of Fish Creek, would not be affected by the project. Flow from the reservoir enters the Middle Fork of Fish Creek which joins the South Fork of Fish Creek approximately 200 feet downstream of the falls (see Figure 3-6).

3.11.3 Existing Visual Condition

3.11.3.1 Viewpoint Locations

Six key viewpoints were selected for the purpose of assessing existing visual conditions (Figure 3-31, Key Viewpoints). The key viewpoints consist of the six locations that are, or have the potential to be, the most frequented by the public and that have a relatively clear view of proposed project features. The location of each viewpoint is described below.

Viewpoint A - This viewpoint is located at the southwestern edge of the existing campground and includes views of the reservoir and the main dam (see Figure 4-1, Viewpoint A).

Viewpoint B - This viewpoint is located at the western edge of Campground Relocation Site 1 (see Figure 2-5) looking towards the reservoir (see Figure 4-2, Viewpoint B).

Viewpoint C - This viewpoint is located along FDR 310, immediately after its intersection with the turnoff to Fish Creek Reservoir (see Figure 4-3, Viewpoint C). This viewpoint is intended to examine impacts to the hikers, mountain bikers, and others travelling along FDR 310.

Viewpoint D - This viewpoint is located at the point at which FDR 310 becomes a trail leading to Long Lake reservoir (see Figure 4-4, Viewpoint D). This area is currently used by mountain bikers and hikers and is being considered for upgrading by the Forest Service into an official trailhead.

Viewpoint E - Viewpoint E is located on the existing campground access road, looking towards the proposed campground (see Figure 4-5, Viewpoint E). This viewpoint is included to examine the visual impacts of a relocated campground.

Viewpoint F - This viewpoint is located on the northern shore of the reservoir, on a point west of the existing saddle dam, looking towards the saddle dam (see Figure 4-6, Viewpoint F).

3.11.3.2 Landscape Description

The Fish Creek Reservoir and its surrounding landscape is characterized by the rocky terrain and undulating topography typical of areas near the Continental Divide. The vegetation is characterized by large stands of mixed conifer forest interspersed with open, upland meadows and montane wetlands. The mixed conifer forest is dominated by Engleman spruce, lodgepole pine and subalpine fir. In addition to the large expanse of water provided by the reservoir, there are many smaller bodies of water in the area, such as wetlands, creeks, and lakes, including Summit Lake, Dinosaur Lake, and Long Lake.

Specific views of the project site from the six viewpoints are characterized by the horizontal lines of the treeline and existing dam and the rolling form of the hills. Foreground trees provide contrasting vertical lines in Viewpoints A and B. The reservoir shoreline provides undulating, rounded lines from Viewpoints A, B, and C. Where the foreground consists of coniferous trees and/or rocky slopes (Viewpoints A, B, and F), the texture is generally coarse. Where open meadows and wetlands comprise the foreground (Viewpoints C, D, and E), the texture is finer grained.

When the reservoir is full, the reservoir shoreline appears relatively natural, due to the rocky shoreline interspersed with vegetation. There are two small islands with vegetation and a number of small, unvegetated rock outcroppings protruding above the water surface. The water is relatively clear, due to its high-mountain snowmelt characteristics. The shoreline is relatively stable, since

water levels do not fluctuate except during annual drawdowns. The reservoir historically has been drawn down on an annual basis, beginning in August and ending with the spring runoff period (April or May), to approximately 35 percent of its storage capacity.

When the reservoir is full, the existing 650 foot long dam is visible from Viewpoints A and C. The dam has a crest height of 55 feet, which is visible from Middle Fork Fish Creek downstream of the dam. Upstream of the dam, only the freeboard is visible when the reservoir is full. If drawn down completely, the entire 55-foot height is visible. The dam's horizontal lines are compatible with the area, but the dam's straight, rigid quality and the lack of trees behind much of it make it obviously a man-made structure. The rock rip-rap, however, helps the dam blend in with its surroundings in terms of color and texture. The existing, 400-foot long saddle dam, visible from Viewpoint F, blends into the landscape in terms of color and texture, due to the rock rip-rap, but the straight, linear form of the dam contrasts with its surroundings. The saddle dam is 16 feet tall, but as with the main dam, this height is only visible from downstream (Puppy Dog Lake) or from upstream during reservoir drawdown.

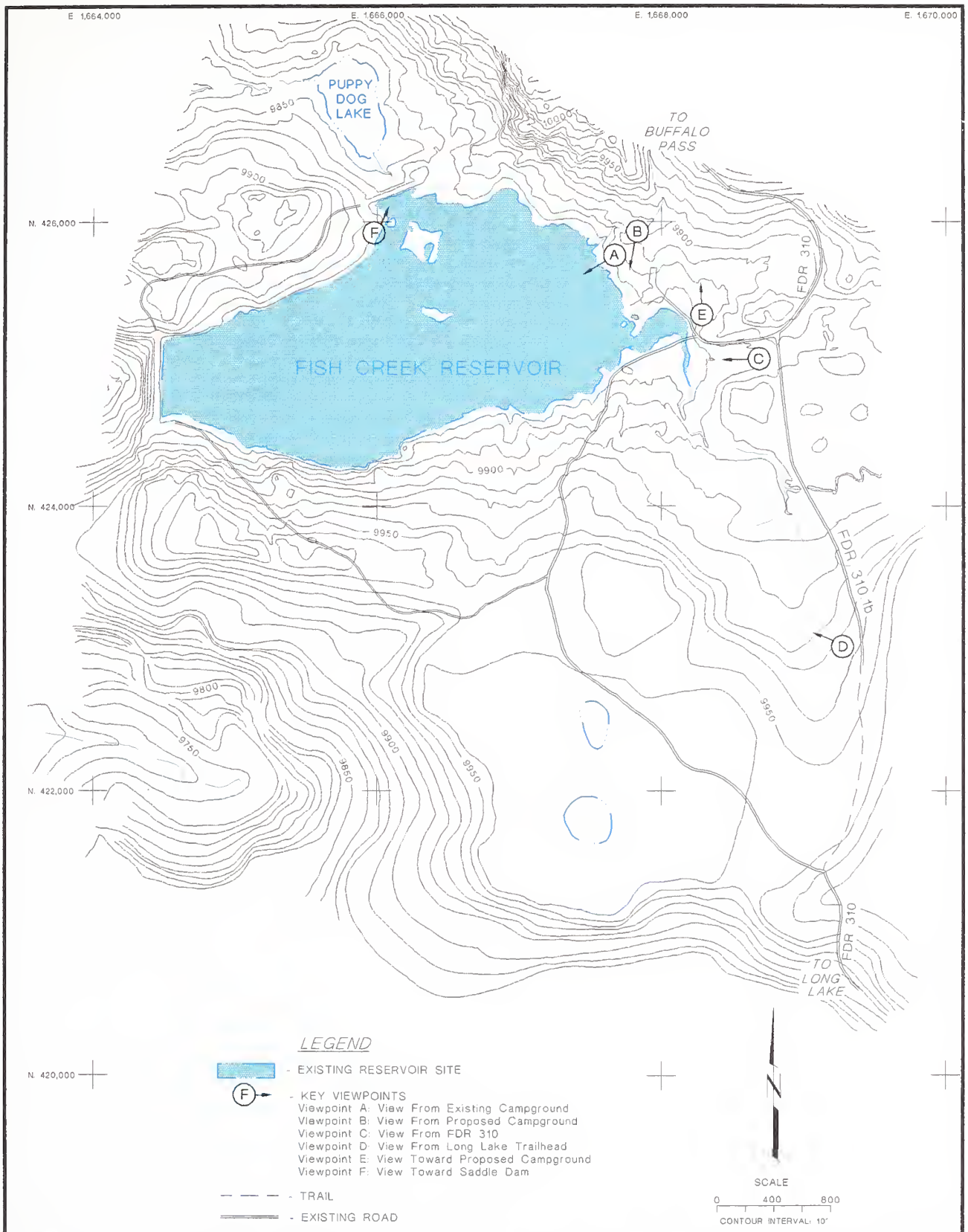
The existing structures at the site (maintenance shed and vault toilet), are both situated near trees, which allow their vertical form to blend in with the surroundings. The maintenance shed's color and texture, however, are not compatible with the surroundings. In addition to the vault toilet, the existing campground contains five fire rings and picnic tables, linked by user-created trails to a gravel parking lot and boat launch. The campground facilities are generally screened by the forested setting and undulating topography. The reservoir access roads are located south of the reservoir, connecting FDR 310 to the dam, and north of the reservoir, connecting the main dam and saddle dam. These roads contrast with their surroundings in terms of color and texture.

The overall quality of the views at Fish Creek Reservoir would be considered moderate to high. The Forest Service has designated the area around the Fish Creek Reservoir as having a Class B variety class. A Class B variety is considered "common" compared to "distinctive" for Class A or "minimal" for Class C. The area's moderately rolling slopes and lack of steep, dominant landforms contribute to the Class B designation, as does the lack of outstanding or unusual rock outcrops and the lack of unusual vegetation patterns. The presence of 90 acres of water, however, increases visual variety. The reservoir is not as attractive as other Rocky Mountain Lakes surrounded by spectacular features, such as snow capped peaks, but its expansive view of water and relatively natural appearing, rocky shoreline contributes to the visual variety and creates an attractive landscape feature. Although there are many other lakes in the vicinity of Fish Creek Reservoir, there are none as large as the reservoir, and most are not as easily accessible, which gives it value in terms of scarcity.

3.11.4 Sensitivity

The Fish Creek Reservoir is of high sensitivity because of its use for recreation purposes and its proximity to a growing resort community. Although use levels are not as high as in other parts of the Forest, its location near the popular Buffalo Pass area makes it an integral part of this important recreation destination. The reservoir provides a destination for mountain bikers and others traversing the forest via Fish Creek Falls Trail, Long Lake, and the Buffalo Pass Road.

The entire Fish Creek Reservoir area has been designated by the Forest Service as a Sensitivity Level 1 area, because it is visible from a primary travel route (FDR 310) and at least one-fourth of the visitors are interested in scenic quality (USDA, no date). All of the six viewpoints would fall within this Sensitivity 1 area. The FDR 310 viewpoint (Viewpoint C) and the Long Lake Trailhead (Viewpoint D) would have the highest visitation due to the mountain bikers, hunters, hikers and others traversing the area. The campground viewpoints (Viewpoints A, B, and E) would most likely



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FISH CREEK RESERVOIR EIS

FIGURE 3-31

KEY VIEWPOINTS

be the next most visited areas, with an estimated 1,000 recreation visitor days per year (see Section 3.9). The view duration, however, is longer at the campground than at the FDR 310 viewpoints, since people at the reservoir often spend a longer time there camping, fishing, picnicking, etc. FDR 310 visitors tend to ride, walk or drive by the reservoir and thus have a shorter view duration. Viewpoint F would be the least visited viewpoint, since it can only be accessed by the informal trail along the shoreline.

3.11.5 Forest Service Management Direction

3.11.5.1 Visual Quality Objectives

Visual quality objectives provide Forest Service guidelines for reservoir and recreation facility development. The Forest Service has assigned a visual quality objective of "modification" for the area around the Fish Creek Reservoir, (Management Area 10E), as provided by the management prescriptions in the *Land and Resource Management Plan for the Routt National Forest* (USDA, 1983). This designation is based on an inventory of the area's visual quality and sensitivity, combined with consideration of the area's importance as a municipal water supply. The Fish Creek Reservoir Road (FDR 310) corridor (Management Area 2B) has been assigned a "partial retention" visual quality objective. Under the "modification" objective, facility development or forest management activities may visually dominate the landscape, but alterations must borrow from natural form, line, color, or texture so that their visual characteristics are those of natural occurrences in the surrounding area. Under the "partial retention" objective, facility development or forest management activities must remain visually subordinate and can repeat the existing form, line, color or texture or introduce new form, line, color, or texture if it remains subordinate to the visual strength of the characteristic landscape (USDA, 1974).

3.11.5.2 Existing Compliance with Objectives

The existing dam, as seen from Viewpoints A and C, meets the modification objective because, although it is obviously a man-made structure, it is visually subordinate, its texture and color borrow from the adjacent areas, its horizontal line is consistent with the horizontal lines of the hills and treelines, and its distance makes it visually subordinate from the viewpoints. When full, the reservoir itself, as seen from Viewpoints A, B, C, D, and F, represents a higher visual quality level than the "modification" objective requires, since the undulating, rocky shoreline is similar to natural lakes in the area. When the reservoir is drawn down, however, the existing visual condition is not in compliance with visual quality objectives because of the extent of exposed shoreline.

3.11.5.3 Visual Absorption Capability (VAC)

The VAC provides an indication of the relative difficulty of incorporating future activities, such as the Proposed Action, into the landscape without creating adverse visual impacts. The VAC represents the challenges in meeting visual quality objectives in the future. The *Visual Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992f) provides a more detailed explanation of VAC and how it was determined for the proposed project site. The analysis indicates that the view of the proposed project site from the key viewpoints would be at the low end of the moderate range in terms of capacity for absorbing visual changes. The moderate rating is due primarily to the area's irregular topography, medium-height trees, the presence of natural openings, and the degree of variety in the colors.

3.12 CULTURAL RESOURCES

3.12.1 Introduction

A Class III cultural resources inventory and limited testing of aboriginal archaeological sites in and around Fish Creek Reservoir was conducted by Metcalf Archaeological Consultants, Inc. A complete account of the results of this survey appear in *A Class III Cultural Resources Inventory and Evaluative Test Excavations for the Fish Creek Reservoir Expansion, Routt County, Colorado* (MAC, 1992). The following discussion presents the main findings of this report.

3.12.2 General Background

The project area is located west of the Continental Divide near the confluence of the Middle Fork of Fish Creek and Granite Creek. Elevation of the project area ranges from about 9,840 to 9,970 feet (2,999 to 3,039 m). Vegetation around the reservoir is a mixture of alpine wetlands and meadows in a climax forest of Spruce-Fir. Geologically, the project lies in an area where Pre-Cambrian igneous granitic rocks (circa 1.7 million years old) interfinger with Quaternary glacial drift from the Pleistocene-aged Pinedale and Bull Lake advances (Tweto, 1979). Most or all of the potential borrow areas appear to be situated over unconsolidated surface deposits which mark the Pleistocene materials. Other Pre-Cambrian metamorphic rocks of similar age to the granitic rocks are nearby and include felsic and hornblendic gneisses rocks. Although a few areas of relatively steep slopes exist, most of the project area is relatively gently sloped with rounded outcrops occasionally present. Many areas in the flat to very gently sloping valleys are actually natural depressions and contain shallow ponds. Soils in the project area were exposed along road cuts and examined during limited testing at the aboriginal sites. They are generally shallow and characterized by rounded gravels deposited during the Pleistocene. Deeper soils are undoubtedly present in the wetlands but no exposures were observed.

The climate of the area today is typical of high altitude mountain settings. Summers are short and cool, with temperatures rarely exceeding 95 degrees. Winters are cold with considerable snow fall. During winters, temperatures typically stay at or below freezing. Due to temperature inversions, it is often warmer in the higher elevations than along the Yampa River valley in the winter. Precipitation falls mainly as late summer rains and winter snows.

Prehistorically the climate was similar, but periods of warmer temperatures and greater precipitation are documented by various lines of evidence. These changes in climate probably did not cause large scale alteration of either the floral or faunal communities in the project area. Rather, small shifts in the various ecotone edges would have occurred within the immediate project area. Elevation shifts in the ecotones would have occurred outside the project area but would also have been relatively moderate in scale. Among others, Benedict and Olson (1978) and Madole (1991) have presented discussions of paleoclimate in the Central Rocky Mountains.

Land use within the project area has been historically limited. Timbering, big game hunting, fishing and some recreational camping and hiking appear to be the dominant activities. The reservoir serves as a water source for the City. Ranching and mining do not appear to have occurred in the project area, although they have been the predominant economic activities in the Yampa River valley.

Land use prehistorically also appears to have been rather limited. Useful resources would include the flora and fauna. Lithic resources are limited to stones of relatively poor quality for knapping purposes. All or most of the utilization of the area would have occurred during the short summers.

3.12.3 Results of Survey

One previously recorded site was relocated and updated and two newly discovered aboriginal sites and two dams were recorded during this project. Sites were evaluated against the criteria for eligibility for inclusion in the National Register of Historic Places (NRHP) (36 CFR §60.4). All five sites are evaluated as not significant and it is recommended that they be considered not eligible for inclusion in the NRHP.

3.12.3.1 Previous Site

One site was originally located during a survey of a planned expansion of Fish Creek Reservoir similar to the current project (Jennings, 1982). It was described as a very low density lithic scatter consisting of five pieces of (unspecified lithic type) debitage over a 125 N/S x 75 E/W meter area. During the current investigations, the site was relocated. It is probably a prehistoric aboriginal open lithic scatter. Although the observed artifacts differ in number, type and distribution from those originally reported, the original documentation is essentially correct. Current investigations located six artifacts over a 90 NW/SE x 18 NE/SW meter area.

Although at least four of the six artifacts located during the current investigations are not part of the original inventory of five pieces of debitage. The overall character of the site is still a very low density lithic scatter. Based on the diversity of artifacts, and high ratio of tools to debitage, the site may be a limited activity locus. The original site map does not closely conform to the landscape and may thus overestimate the distribution of artifacts. However, the ground cover is relatively dense and additional artifacts may, in fact, exist beyond the site boundary as drawn during the current investigations.

This site is a low density artifact scatter. Limited testing and examination of numerous rodent burrow spoils failed to locate subsurface artifacts. No means of establishing chronological control was evident. Current investigations agree with the original documentation and it is again evaluated as not significant and it is recommended that it be considered not eligible for inclusion in the NRHP. No further archaeological work is recommended for the site.

3.12.3.2 Saddle Dam (ACZ-1)

The Saddle Dam (ACZ-1) site information is primarily from Jennings (1982) who cites Main (1980). It is a earthfill/rockfill dam erected in 1972 over the original spillway constructed in 1954-1955 for the Fish Creek Reservoir. It measures approximately 175 x 450 feet (53 x 137 m). It was designed as a seeping dam with a spillway around its eastern edge. Puppy Dog Lake receives the spillway waters.

No site datum or other archaeological marker was placed on the site. In addition to being too recent to be considered for the NRHP, under the Criteria, the Bureau of Reclamation has provided MAC with significance guidelines for dams (Psass, 1992). In a fashion similar to graveyards, dams are generally not considered significant in and of themselves unless they are of unique engineering, the first of their kind or in some other way atypical. The significance more often centers on their impact to local history. Although the water stored in Fish Creek Reservoir is important to the area, the Saddle Dam (ACZ-1) site would be eligible for inclusion in the NRHP only if it qualified under Criterion Exception "G" which allows consideration of sites less than 50 years old if they can be said to be of "exceptional importance". This is not the case here. Therefore, the Saddle Dam (ACZ-1) site is evaluated as not significant and it is not recommended for inclusion in the NRHP. No further archaeological work is recommended for the site.

3.12.3.3 Main Dam (ACZ-2)

The Main Dam (ACZ-2) site information is primarily from Jennings (1982) who cites Main (1980). It is a earthfill/rockfill dam erected in 1954-1955 across the Middle Fork of Fish Creek. No site datum or other archaeological marker was placed on the site. In addition to being too recent to be considered for the NRHP, under the Criteria, the Bureau of Reclamation has provided MAC with significance guidelines for dams (Psass, 1992) as discussed above in Section 3.12.3.2. The Main Dam (ACZ-2) site is evaluated as not significant and it is not recommended for inclusion in the NRHP. No further archaeological work is recommended for the site.

3.12.3.4 ACZ-3

Another site (ACZ-3) is an aboriginal lithic scatter that is probably prehistoric and is situated on the end of a ridge near Granite Creek. Large glacial boulders form the ridge, which extends above the normal waterline of Fish Creek Reservoir.

Cultural materials on the site consist of 15 chipped stone artifacts of translucent white chalcedony which grades into an opaque white coarse-grained chert and white quartzite. A biface of chert, eight tertiary flakes of chalcedony, four tertiary flakes of chert and two micro/retouch flakes of chalcedony were observed. One of the chalcedony tertiary flakes was recovered from a test probe. The sole quartzite artifact is also a tertiary flake.

This site is an open lithic scatter which, based on the types of debitage and the tool, may have been a short term camp with some tool manufacture/maintenance activities. Limited testing yielded a subsurface artifact. Given the small quantity of artifacts and lack of artifact diversity, the site is evaluated as not significant and it is recommended that it be considered not eligible for inclusion in the NRHP.

3.12.3.5 ACZ-4

Another site (ACZ-4) located is a small aboriginal lithic scatter which is probably prehistoric. The site is located between a proposed road and a potential borrow area. Site elevation is 9,940 feet.

Cultural materials on the site consist of light gray quartzite tertiary flakes and micro/retouch flakes. The materials range in size from about 6 cm to 1 cm in length. Micro/retouch flakes are present in large numbers. Twenty-two flakes were observed on the surface. The positive shovel probe yielded 17 flakes, all but four of which were less than 1 cm in length.

The site is an open lithic scatter which, based on the artifact distribution and single material type, may have been a single, very short term event consisting of tool manufacture/maintenance activity. Large flakes and retouch flakes are present, indicating both expedient tool manufacture and formal tool. Limited testing yielded a substantial amount of subsurface artifacts in relation to surface manifestations. However, given the small quantity of artifacts and lack of both artifact and arterial type diversity, the site is evaluated as not significant and it is recommended that it be considered not eligible for inclusion in the NRHP.

3.12.4 Project Evaluation

The findings of this project were as expected. Although survey conditions included a great deal of ground cover in various forms, the results of this project are comparable with a similar previous project in the same area (Jennings, 1982). The potential for additional sites in the area is relatively low because most of the areas near the major streams have been used as borrows.

The aboriginal cultural resources located reflect a pattern of low intensity transient use of higher elevations. Although evidence for more long term and even winter occupations at such elevations is becoming more common (see Metcalf and Black, 1991), settings such as the Fish Creek Reservoir were utilized primarily for the procurement of specific resources and occupations appear to be short term.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES



CHAPTER 4 - ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter identifies and evaluates the effects of implementing the Proposed Action or the project alternatives as described in Chapter 2. Evaluation is based upon the comparison of existing resource values, as presented in Chapter 3, with the implementation of the described alternatives. For some resource areas, the anticipated changes can be readily quantified. Others, however, can only be described in qualitative terms.

The Forest Service alternatives presented in Chapter 2 include:

- Alternative A - No Action
- Alternative B - Fish Creek Reservoir Expansion (Proposed Action)
- Alternative C - Smaller Fish Creek Reservoir Expansion

In addition to these alternatives, several options are available to Alternatives B and C. These options include borrow sites(s) designated to provide materials required for construction, service roads to the dam, power supply source, and campground location. These options are discussed within the resource areas in which their implementation has an impact.

This chapter is organized by environmental resource area, in the same manner as Chapter 3. The environmental impacts of the alternatives on the resource areas are described. Under each resource area, the direct, indirect, and cumulative impacts for the alternatives are evaluated. These impacts are defined as follows:

- Direct impacts - Those effects which occur at the same time and in the same general location as the activity causing the effects

- Indirect impacts - Those effects which occur at a different time or at a different location than the activity to which the effects are related.

- Cumulative impacts - Those effects which, when combined with similar effects from past, present, or reasonably foreseeable future actions, may result in environmental impacts.

Proposed mitigation measures are also defined under each resource area and outlined in Appendix K. Effective mitigation can preclude, prevent, or limit the duration and/or severity of potential project related impacts. After mitigation is discussed, the unavoidable adverse impacts to each resource area are disclosed.

4.2 DAM SAFETY/FLOOD HAZARD

4.2.1 Introduction

The Fish Creek Reservoir, located in the Routt National Forest is situated in an isolated area which is generally inaccessible from November through June of each year. Due to the site's remoteness, the reservoir's performance and flood hazard conditions are difficult to monitor and regulate on a regular basis and the ability to respond to potential dam problems is hindered.

The following discussion presents the impacts resulting from the implementation of the Proposed Action or project alternatives. The evaluation concentrates on the main and saddle dams, reservoir, outlet works and spillway. The discussion also includes potential impacts to the primary borrow sites designated to provide materials required for construction and dam service roads. The potential impacts of the power supply options are also discussed. These options (as described in Chapter 2) are relevant to the dam safety/flood hazard discussion.

4.2.2 Direct and Indirect Impacts

4.2.2.1 Alternative A - No Action

The direct and indirect impacts associated with dam safety and flood hazard under Alternative A would result in status quo conditions. In terms of dam safety and flood hazard conditions, under Alternative A, the current structure would remain in operation with no alteration to the main dam, saddle dam, or spillway. No early warning system would be installed, and thus, the City would not be alerted to potential dam problems. Annual dam inspections by the State would continue. More regular dam inspections would not be performed, since access is unavailable for up to eight months of the year (November through June) due to snowfall and weather conditions. Since no power would be installed, operation and control of the Fish Creek Reservoir outlet works would continue to be done on-site through manual adjustments to the outlet valve.

Flood hazard potential downstream of the existing Fish Creek Reservoir, due to catastrophic dam failure, is discussed in Section 3.2, Dam Safety/Flood Hazard, and also in the *Dam Safety/Flood Hazard Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992a) and the *Water Resources Baseline Technical Report for the Fish Creek Reservoir Expansion EIS* (ACZ, 1992b). This discussion is based on the dambreak analysis done by Woodward-Clyde Consultants (WCC, 1992c) which is found in Appendix F. Peak flow discharges immediately downstream of Fish Creek Reservoir would be 63,200 cfs. The study indicates that peak depth on Fish Creek at the water filtration plant would be 17 feet at 1.1 hours after dam failure. A flood wave of 20 feet would occur on Fish Creek at Highway 40 at 1.3 hours after dam failure. The peak depth on the Yampa River at Riverside Drive would be 10 feet at 1.9 hours after dam failure. Table 4-1, Results of Dambreak Analysis for Fish Creek Reservoir, presents the peak flow, peak depth and elapsed time from dambreak for each of the three alternatives.

4.2.2.2 Alternative B - Proposed Reservoir Expansion

Alternative B is the proposal to raise and improve the existing dams and expand the reservoir from its current storage capacity of 1,842 AF to 4,122 AF (an increase of 2,280 AF). This alternative would result in both short and long-term, as well as direct and indirect impacts to dam safety and flood hazard.

Under Alternative B, an upstream raise design has been proposed for the enlargement of the main dam. This construction technique would result in the reduction of the quantity of fill materials and a decrease in the amount of seepage through the existing embankment. Additionally, to minimize seepage through the main dam embankment foundation and the underlying bedrock, a positive cutoff trench and a grout curtain in bedrock has been incorporated into the final design (WCC, 1992b). These construction methods would result in a safer dam structure.

TABLE 4-1
RESULTS OF DAMBREAK ANALYSIS FOR FISH CREEK RESERVOIR

Location	Alternative A - No Action			Alternative B - Applicant's Proposal			Alternative C - Small Reservoir Expansion		
	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)
Fish Creek Downstream of Dam	63,200	12	0.9	136,200	16	0.7	80,400	13	0.7
Fish Creek @ Mt. Werner Water filtration plant	41,000	17	1.1	103,700	23	0.9	61,300	19	0.9
Fish Creek @ Highway 40	35,000	20	1.3	89,200	28	1.0	52,700	23	1.3
Yampa River @ Highway 40	20,800	11	1.7	69,400	16	1.2	41,200	11	1.3
Yampa River @ 2nd Street	20,800	11	1.7	68,100	16	1.2	40,500	11	1.3
Yampa River @ Riverside Drive	20,800	10	1.9	56,900	13	1.0	33,900	11	1.3

Note: [1]Cumulative time from beginning of dam failure to peak flow

(From Dambreak Analysis for Fish Creek Dam Enlargement, WCC 1992)

A high level outlet has also been proposed under Alternative B to allow a greater volume of water to be discharged from the reservoir. This outlet would be founded on bedrock near the left abutment and water would be discharged through a baffled outlet near the base of the dam. This outlet structure could be utilized to maximize the release of water from storage during potentially dangerous, high-flow situations. Also under Alternative B, the saddle dam would be removed and re-constructed to allow for a better foundation and to improve seepage control, thus improving the safety and integrity of the saddle dam. In addition, a new spillway would be constructed in bedrock on the right abutment of the new saddle dam, which would channel flows into the Puppy Dog Lake drainage during peak runoff periods. This is discussed further in Section 4.3, Water Resources.

During construction, short-term impacts would occur and would generally be associated with the draining of the reservoir. Activities such as dewatering for foundation excavations, earthwork construction, and structure foundations, would result in direct impacts to the shallow groundwater conditions. Seepage conditions and flood hazard conditions, however, would be eliminated during the short-term construction stage because Fish Creek Reservoir would be drained and would have no storage during this period.

Flood hazard potential downstream of the proposed dam enlargement due to catastrophic dam failure has been analyzed by Woodward-Clyde (WCC, 1992c) and is presented in Appendix F. Peak flow discharges immediately downstream of Fish Creek Reservoir would be 136,200 cfs, an increase of 73,000 cfs over the No Action Alternative. As a result of this increase, the downstream consequences associated with a dam failure would be increased. The peak depth on Fish Creek at the water filtration plant would be 23 feet at 0.9 hours after dam failure. A flood wave of 28 feet would occur on Fish Creek at Highway 40 at 1.0 hour after dam failure. The peak depth on the Yampa River at Riverside Drive would be 13 feet at 1.4 hours after dam failure. Table 4-1, Results of Dambreak Analysis for Fish Creek Reservoir, presents the peak flow, peak depth and elapsed time from dambreak for each of the three alternatives.

However, due to improved construction techniques and materials, the dam would have improved static and dynamic stability, and therefore, would be a safer structure. Alternative B includes the installation of an early warning monitoring system that would use survey monuments, piezometers, and weirs installed in the main and saddle dams to monitor and check the design criteria. This instrumentation would be incorporated into the early warning and automated data acquisition system (WCC, 1992b). This system would provide the information to alert City officials of direct impacts to the dam embankments so that conditions, which might otherwise go undetected, could be addressed before a catastrophic failure occurred. By responding early to dam conditions, corrective dam maintenance measures could be taken, and/or the *Emergency Preparedness Plan* (Appendix E) could be implemented.

Due to the relatively high density of the embankment materials and shallow foundation soils, the deformation due to static and dynamic (earthquake) loads is expected to be small and within acceptable limits.

4.2.2.3 Alternative C - Smaller Reservoir Expansion

In the early 1980's the City of Steamboat Springs evaluated three alternative increases in the storage capacity of the existing Fish Creek Reservoir, which included a 908 AF increase, a 2,000 AF increase, and a 3,050 AF increase (D&D, 1983). The 908 AF increase is referred to as Alternative C, Smaller Reservoir Expansion. According to a review of the conceptual design elements of this alternative (D&D,1983), Alternative C would have similar direct and indirect impacts as those discussed under

Alternative B. Indirect downstream impacts, though, would be less than those associated with Alternative B, due to a reduction in the storage capacity of the reservoir. Peak flow discharges would increase to 80,400 cfs (see Table 4-1). This represents a 17,200 cfs increase over the No Action Alternative and a 55,800 cfs decrease over the proposed reservoir expansion. A peak depth on Fish Creek at the water filtration plant would be 19 feet at 0.9 hours after dam failure. A flood wave of 23 feet would occur on Fish Creek at Highway 40 at 1.0 hour after dam failure. The peak depth on the Yampa River at Riverside Drive would be 11 feet at 1.5 hours after dam failure.

4.2.2.4 Borrow Sites, Access Roads, and Power Supply

As part of the construction of either Alternative B or C, one or more borrow sites would be utilized. Three borrow areas (A-1, A-2, and B) have been designed for development under Alternatives B or C. Short-term direct impacts which would occur during construction include lowering the shallow groundwater table, which is estimated to be 3 and 19 feet, through dewatering. Riprap requirements would be satisfied with rock from Borrow Areas A-1 or A-2. Blasting of the bedrock would be required to attain the proper riprap size. Indirect impacts associated with blasting the riprap source would include the potential generation of flyrock, noise, and vibrations. Since the borrow areas would be submerged during operation, indirect impacts resulting from the operation of borrow sites during construction are considered negligible.

Under Alternative B or C, one of the three optional dam access routes would have to be utilized during construction to carry materials to the construction site. The access road would also have to be utilized during dam inspections after construction is completed. A further discussion of road impacts is presented in Section 4.10, Transportation.

Under Alternative B or C, one of three optional power sources would be utilized for construction and for the operation of the early warning and remote operational control systems. The underground electrical supply source is the most reliable of the three optional power sources. Power requirements are such that neither the propane nor the solar options could reliably produce sufficient power to operate the outlet valve and the early warning and remote operational control systems.

4.2.3 Cumulative Impacts

Cumulative impacts to dam safety and flood hazards associated with Alternative A would occur as a result of future development within the flood inundation area identified in Section 3.2. Increased development downstream of the Fish Creek Reservoir would elevate the likelihood of loss of property and life in the event of dam failure.

If Alternative B is combined with potential future development within the flood inundation area (See Section 3.2), cumulative impacts would include an increase in the potential downstream consequences involving loss of property and life. These impacts would be balanced to a certain degree, however, by the proposed increases in dam safety (including improved construction techniques and materials, and the installation of an early warning system).

Cumulative impacts associated with Alternative C would be similar to those of Alternative B, although the volume of water which would be released in the event of a dam failure under Alternative C would be reduced.

4.2.4 Mitigation and Enhancements Summary

Essentially, the mitigation necessary to ensure dam safety and reduce potential flood hazards would be incorporated into the final designs of Alternatives B or C.

4.2.5 Unavoidable Adverse Impacts

Unavoidable adverse dam safety/flood hazard impacts associated with the implementation of Alternative A include the continued operation of the dam in the absence of early warning and remote operational control systems. The downstream consequences of a dam failure would remain the same.

If Alternative B or C is implemented, the current reservoir would be expanded. This expansion would increase the storage capacity of the reservoir and would, therefore, increase the downstream consequences associated with a dam failure. The downstream consequences of a dam failure would be greater under Alternative B than under Alternative C since the proposed reservoir storage capacity is greater under Alternative B. This unavoidable adverse impact would be balanced to a certain degree, however, by the improved dam design and construction techniques, and by the installation of an early warning system which is proposed under both Alternatives B and C.

4.3 WATER RESOURCES

4.3.1 Introduction

Alternatives A, B and C are described below in terms of the physical characteristics of the dam and reservoir, the availability of water to fill the reservoir annually, construction sequencing, operational differences between alternatives, problems associated with erosion and sedimentation, and water rights. Additionally, impacts associated with water quality, water demand, and reservoir storage requirements are discussed.

4.3.2 Direct and Indirect Impacts

4.3.2.1 Alternative A - No Action

Alternative A, the No Action Alternative, assumes that the City would continue to operate Fish Creek Reservoir as it is presently operated. Section 3.3, Water Resources describes the physical characteristics of the reservoir, and its operation.

Physical Characteristics - Under the No Action Alternative, the physical characteristics of the reservoir would remain the same. To summarize, the existing Fish Creek Reservoir has a storage capacity of 1,842 AF and a surface area of approximately 90 acres. The main dam is 650 feet in length, and has an embankment crest elevation of 9,874 (55 feet high). The saddle dam is 400 feet in length, and has an embankment crest of 9,871.5 feet (16 feet high). Water supply from the Upper Middle Fork of Fish Creek and Granite Creek is sufficient to fill the reservoir at its present capacity (1,842 AF) in both an average flow year (7,723 to 8,560 AF) and during a 25-year low flow year (3,570 AF). See Section 3.3, for a description of how available water supply flows were estimated.

Construction Plan - There would be no construction activities under Alternative A.

Operation Plan - Under Alternative A, there would be no change in the operation of the reservoir. Fish Creek Reservoir, as it is currently operated, fills to capacity during the spring snowmelt runoff period with water from the Upper Middle Fork of Fish Creek and Granite Creek by the end of May or beginning of June. When the reservoir reaches capacity, there is flow through the spillway into the Puppy Dog Lake drainage. As described in Section 3.3, Water Resources, there has been considerable erosional damage from flows released through the spillway exceeding the carrying capacity of this smaller drainage basin. In July, the outlet works at the main dam are manually adjusted and flows are released to the Middle Fork of Fish Creek. Downstream of the confluence of the Middle Fork of Fish Creek with the Puppy Dog Lake drainage, the channel condition returns to normal within approximately 0.25 miles. Under Alternative A, this erosional process would continue, unless corrective action is taken by the Forest Service.

Water Rights - There would be no change in the administration of water rights in the Fish Creek drainage basin under Alternative A. Eventually, however, the City would lose its 2,000 AF conditional water storage right.

Water Demand/Reservoir Storage Requirements - Under the No Action Alternative, a total reservoir storage capacity of 2,238 AF would be available to the City, as shown in Table 4-2, Summary of Reservoir Capacities and Projected Reservoir Storage Needs. Future water demands, however, would exceed available water supply. The City would have enough water to meet their 20-year demands, but insufficient storage to meet their long-term 40-year demand projections. Mt. Werner presently has no storage water rights and cannot meet present water demands. Mt. Werner would have to develop additional water supplies to meet present and future water demands and/or implement water restrictions and conservation methods. Under Alternative A, Mt. Werner would have to develop, at a minimum, 376 AF/year of additional supply to meet 20-year projections and 1,556 AF/year to meet 40-year projections. If the two entities (the City and Mt. Werner) consolidate, at least 1,926 AF/year (4,164 AF demand-2,238 AF storage) of additional water supply would have to be developed to meet 40-year projections.

TABLE 4-2
SUMMARY OF RESERVOIR CAPACITIES AND PROJECTED RESERVOIR STORAGE NEEDS (AF)

RESERVOIR CAPACITY[1]	CITY		MT. WERNER		CONSOLIDATED[4]	
	2013	2033	2013	2033	2013	2033
Alternative A	2,238	2,238	0	0	2,238	2,238
Alternative B	2,808	2,808	1,710	1,710	4,518	4,518
Alternative C	2,465	2,465	681	681	3,146	3,146
CAPACITY REQUIREMENTS TO MEET WATER DEMANDS[2]	1,012	2,608	376	1,556	1,143	4,164
TOTAL CAPACITY REQUIREMENTS[3]	1,826	3,981	1,278	2,871	2,773	6,851
TOTAL CAPACITY REQUIREMENTS WITH 20% CONSERVATION[3]	1,330	3,049	782	1,939	1,779	4,985

NOTES:
[1] - Includes Fish Creek Reservoir and Long Lake
[2] - See Table 3-15
[3] - See Table 3-16
[4] - Capacity requirements for a consolidated water district does not necessarily equal the sum of the City and Mt. Werner requirements. If the two entities consolidate, the City could utilize excess Mt. Werner stream flow prior to utilizing storage capacity.

Water Quality - As stated previously, the City and Mt. Werner would have to develop additional water supplies under Alternative A. These additional water supplies would not be equal to the Fish Creek supply in terms of water quality. Dependent upon the quality of the supply, extensive treatment might be required.

Under Alternative A, the erosional damage to Puppy Dog Lake drainage, and the subsequent downstream sedimentation, would continue unless corrective action is taken by the Forest Service.

Cumulative water quality impacts associated with increased recreational use of Fish Creek Reservoir are discussed in Section 4.3.3

4.3.2.2 Alternative B - Proposed Reservoir Expansion

Physical Characteristics - Alternative B is a 2,280 AF expansion of the present Fish Creek Reservoir. The total capacity of the reservoir under Alternative B would be 4,122 AF covering 140 acres. This represents an increase in surface area of approximately 50 acres. The main dam length would be 830 feet (an increase of 180 feet), and the height would be 75 feet (an increase of 20 feet). The saddle dam would be increased in length to 1,060 feet (an increase of 660 feet), and the height would be 40 feet (an increase of 24 feet). Water supply from the Upper Middle Fork of Fish Creek and Granite Creek would be sufficient to fill the proposed reservoir expansion during average years. However, during a 25-year low-flow period, the 3,570 AF available as inflow would fall 550 AF (or approximately 13 percent) short of filling the 4,122 AF reservoir, assuming that the reservoir was totally empty prior to spring runoff.

Construction Plan - Construction under Alternative B is anticipated to occur over two construction seasons. During the first construction season activities would include mobilization, borrow area drainage, excavation of borrow materials, removal of the saddle dam, partial construction of the main dam raise, modifications to the existing outlet works, construction of the high level outlet works, and stream diversion for the upper tributaries (WCC, 1992a). The saddle dam would be breached after the spring runoff flows occur in May and early June, and after the reservoir is drawn down to the base of the existing saddle dam. When the saddle dam is breached, stream flow from the Upper Middle Fork of Fish Creek and Granite Creek would be diverted through the breached dam into the Puppy Dog Lake drainage. Average monthly flows that occur in the summer months after spring runoff (July through September) in the Upper Middle Fork of Fish Creek over the period of record October, 1984 to September, 1991 range from 0.35 cfs during September to 2.34 cfs during July. Average monthly flows during July through September in Granite Creek over the same period of record range from 0.92 cfs in September to 6.24 cfs during July. Flows of this magnitude would not result in additional erosional damage to the Puppy Dog Lake drainage. The Applicant would finance a Forest Service position to oversee the implementation of this alternative and monitor the project during construction.

During the second construction season, the existing outlet and the high level outlet works would be operational so that the diversion channel would be removed and flow would be directed through the main stem of the Middle Fork of Fish Creek. Work would then be completed on the saddle dam.

Erosion and sedimentation control measures, utilizing best management practices, would be required throughout the construction period by both the Forest Service and the WQCD. Additionally, stream monitoring would be required.

Operation Plan - The primary design goal for the proposed operation plan for Alternative B is to minimize potential erosional impacts to and degradation of the Puppy Dog Lake drainage. An additional goal of the proposed plan is to provide for the maintenance of in-stream flows. Implementation of this operating plan would utilize the additional outlet capacity of the proposed reservoir, the capability to operate the outlet structures remotely, and the ability to remotely monitor reservoir level and influent flows.

The capacity of the outlet structures in the proposed dam enlargement would increase from approximately 60 cfs to approximately 200 cfs. By allowing larger volumes of spring runoff to be released to the Middle Fork of Fish Creek, flows over the spillway would be minimized during spring runoff.

The remote telemetry system would monitor inflows from the Upper Middle Fork of Fish Creek and Granite Creek, the release rate of reservoir flows to the Middle Fork of Fish Creek through the outlet structures, and the reservoir level. The release rate could be remotely adjusted to allow complete filling of the reservoir to occur in late June, or early July, rather than early June.

Once the reservoir is filled, the outlet would be adjusted as necessary to ensure that spillway flows would not exceed 20 cfs. The operation plan could be modified if the maximum proposed spillway flow of 20 cfs was found to be inadequate for erosion protection in the Puppy Dog Lake drainage (Birch, 1992a). This would be determined through monitoring efforts.

Water Rights - As described in Section 3.3, Water Resources, two conditional water rights were filed by the City in anticipation of enlargement of the Fish Creek Reservoir. The first conditional storage right obtained in 1980 was for 2,000 AF. The second conditional storage right was filed in August 1992 for 200 AF. The Colorado Water Conservation Board (CWCB) objected to this filing on the basis that the Applicant's proposed reservoir expansion would inundate existing, minimum stream flow rights on the Upper Middle Fork of Fish Creek, and Granite Creek that are senior to the additional 200 AF. In a stipulation agreement between the City and the CWCB, CWCB recognizes that the City intends to release water from the 200 AF enlargement in order to maintain in-stream flows in downstream sections of Fish Creek, and that the City would develop a Donation Agreement. This agreement requires that the City construct habitat improvement structures in lower Fish Creek. The stipulation was formally adopted by both parties on December 31, 1992 and is presented in Appendix G.

Water Demand/Reservoir Storage Requirements - Under this Alternative, a total reservoir storage capacity of 4,518 AF would be available as shown in Table 4-2. With the implementation of Alternative B, both the City and Mt. Werner would have sufficient water supply to meet present and projected 20-year water demands. Effective conservation measures and/or the utilization of the infiltration galleries or fisheries pool during low flow/peak demand periods would be required, however, to meet long-term 40-year demands projections. This would be the case whether or not the two entities would choose to consolidate. Under this alternative, approximately 1,030 AF of storage capacity would be available as a fisheries pool during most years.

Water Quality - With the implementation of Alternative B, the community would continue to receive high quality water from the Fish Creek basin. The development of additional water supplies would not be necessary.

Temporary water quality impacts at the site could occur during construction activities in the form of increased sedimentation. Best management practices, however, would be utilized during construction to minimize erosion, sedimentation, and the subsequent increase in stream turbidity and suspended solids. Additionally, stream monitoring would be required. During construction, there would also be the potential for petroleum based contamination from heavy equipment leaks and/or spills. A spill prevention and response plan would be required within the construction operating plan.

Under Alternative B, the erosional process in Puppy Dog Lake drainage would be reduced. This would result in a decrease in downstream sedimentation.

With the implementation of Alternative B, the existing vault toilet, which is no longer functional, would be replaced with a composting toilet. Utilization of a composting toilet would protect the water quality of the reservoir by preventing the introduction of untreated wastewater.

Under Alternative B, approximately 50 acres of land would be inundated. Most of this area would be within borrow areas, and thus would not be vegetated at the time of inundation. Small areas of vegetation, however, would be inundated. Given the short growing season at the reservoir site, the existing highly oxygenated, high quality water source, and the minor extent of vegetation to be inundated, water quality impacts associated with inundation are expected to be negligible.

Cumulative water quality impacts are discussed in Section 4.3.3.

4.3.2.3 Alternative C - Smaller Reservoir Expansion

Physical Characteristics - Alternative C would be a 908 AF expansion of the existing Fish Creek Reservoir. The total capacity of the small scale reservoir would be 2,750 AF covering 112 acres (an increase in surface area from the existing reservoir of approximately 22 acres). The main dam length would be 750 feet (an increase of 100 feet), and the height would be 63 feet (an increase of 8 feet). The saddle dam would be increased in length to 800 feet from 400 feet, and the height would increase to 26 feet from 10 feet. Water supply from the Upper Middle Fork of Fish Creek and Granite Creek would be sufficient to fill the small scale enlargement during average years, as well as the 25-year low flow period.

Construction Plan - The construction plan for Alternative C would be the same as for Alternative B. Two construction seasons would still be required, and a diversion structure for the Upper Middle Fork of Fish Creek and Granite Creek would be required during the first construction season.

Operation Plan - The operation plan for Alternative C would be the same as for Alternative B, resulting in a decrease in erosion and sedimentation impacts in the Puppy Dog Lake drainage from the current reservoir operation.

Water Rights - The additional storage capacity of Alternative C is 908 AF. This additional amount of storage could be exercised under the conditional storage right of 2,000 AF. Eventually, however, the City would lose the remainder of this conditional storage right. The stipulated agreement between the City and CWCB would not be pertinent since the additional 200 AF storage right would not be exercised under this alternative.

Water Demand/Reservoir Storage Requirements - Under this Alternative, a total reservoir storage capacity of 3,146 AF would be available as shown in Table 4-2. With implementation of Alternative C, the City could meet its present and 20-year projected future water demands. It would not, however, be able to meet its long-term 40-year water demands. Alternative C also would not meet the projected future demands of the Mt. Werner district. The City and Mt. Werner would have to develop additional supplies of approximately 1,000 AF/year to meet 40-year projected demands. If the two entities were to combine, Alternative C would not meet future (2033) demands. A long-term fisheries pool would not be possible.

Water Quality - As stated previously, under Alternative C, Mt. Werner and the City would have to develop an additional water supplies to meet future 40-year projected demands. The additional water supply would not be equal to the Fish Creek supply in terms of water quality. Dependent upon the quality of the supply, extensive treatment could be required.

Additional water quality impacts associated with the implementation of Alternative C are the same as those discussed under Alternative B.

4.3.3 Cumulative Impacts

Increased recreational use of Fish Creek Reservoir and the continued use of the adjacent area for sheep grazing, could result in minor water quality impacts to the reservoir. Of concern are potential increases in the presence of fecal coliform (from humans and/or animals) and runoff of petroleum products from cars into the reservoir. According to the Forest Service, grazing is not permitted within 500 feet of the reservoir.

Cumulative impacts associated with a reduction in water demand (resulting from the implementation of water conservation measures) would include cost savings associated with the decrease in water and wastewater treatment volumes. Water and wastewater treatment operation and maintenance costs would be reduced and costly treatment plant expansions could be avoided. Additionally, infrastructure capital and operation costs associated with the distribution of water and collection of wastewater could be reduced. With a metered billing rate, however, a reduction in water demand could also result in decreased revenues.

4.3.4 Mitigation and Enhancement Summary

Mitigation of the erosional damage to the Puppy Dog drainage is suggested for all three alternatives. Future degradation of this drainage would be prevented with the implementation of Alternatives B or C. Under the No Action Alternative, the Forest Service would make a determination as to the steps necessary to correct this concern.

Erosion control mitigation and stream monitoring during construction activities is recommended for the two action alternatives (B and C) to prevent stream sedimentation and preserve stream water quality. A spill prevention and response plan would also be required within the construction operating plan.

Additionally, a fisheries pool is recommended to maintain fisheries, visual resources, and the recreational atmosphere at Fish Creek Reservoir. This fisheries pool would be used as a back-up water supply during extreme drought years.

4.3.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts associated with Alternative A include the continued degradation of the Puppy Dog channel, insufficient availability of the Fish Creek water supply for the City and Mt. Werner, the potential development of inferior water supplies for a portion of the service area, and no remote operational control systems.

No unavoidable adverse water resource impacts are associated with Alternative B.

Unavoidable adverse impacts associated with Alternative C include insufficient availability of the Fish Creek water supply for the City and Mt. Werner and the potential development of inferior water supplies.

4.4 SOCIOECONOMICS

4.4.1 Introduction

Potential socioeconomic impacts associated with the Alternatives A, B, and C are presented in this section. Potential direct and indirect impacts are discussed under the broad general categories of socioeconomic climate, public safety, water utility rates, and reservoir financing.

4.4.2 Direct and Indirect Impacts

4.4.2.1 Alternative A - No Action

Socioeconomic Climate - Alternative A could impact the socioeconomic climate of the community if a supplemental water source is not obtained. The lack of water resources could potentially limit growth. If water resources become limited to the extent that they restrict growth, the cost of living in the community could increase. In addition, if a lesser quality water source than Fish Creek is obtained, some community members would have to rely on this lesser quality water which could cause dissatisfaction.

Public Safety - As discussed in Section 4.2, under Alternative A, no early warning system would be installed to warn the community in the event of a dam failure. Furthermore, no remote control system would be installed to allow the City to respond to uninitiated changes in dam operation. Potential flood impacts associated with the No Action Alternative are presented in Section 4.2.

Water Utility Rates - Mt. Werner and the City have recently implemented metered rate structures as discussed in Section 3.4. No further rate changes beyond those discussed are anticipated for either the City or Mt. Werner under Alternative A.

Reservoir Financing - Alternative A would not need a reservoir financing program. The resolution passed by City Council for reservoir financing would be void. A loan has already been secured for the proposed reservoir expansion by Mt. Werner. This loan was applied for in advance of a Forest Service decision, in the interest of the City and Mt. Werner, in order to capture low interest rates. The interest payment on the loan would be a loss, since nothing would be built, and the loan would be repaid. Expenditures to date of approximately one million dollars (for analysis and design) would be lost.

Neither Mt. Werner nor the City would further increase water rates or increase property taxes to pay for the proposed expansion. Mt. Werner would pay for its portion of the proposed $6,000,000 expansion through user fees and a City rebate and the City would likely pay for its share through general fund sales tax revenues. For both Mt. Werner and the City, these funds would be available for other purposes if the No Action Alternative is selected. Mt. Werner would likely utilize the money for the development of an alternate water supply source and/or the construction of other capital improvement projects. Since the City's portion of the payment would likely be coming from the general fund, the City Council would re-prioritize its capital improvement projects. The money would not necessarily go towards water utility projects (Birch, 1992d).

4.4.2.2 Alternative B - Proposed Reservoir Expansion

Socioeconomic Climate - As discussed in Section 3.4, water availability in Steamboat Springs has not promoted or prevented growth in the community. Rather, it has enabled normal growth patterns to proceed. Under Alternative B, this trend would continue since water would not be a limiting resource to growth.

Public Safety - As discussed in Section 4.2, under the Proposed Action, an early warning system would be installed to warn the community in the event of a dam failure. Furthermore, a remote control system would be installed to allow the City to respond to uninitiated changes in dam operation. Potential flood impacts associated with Alternative B are greater than those associated with the No Action Alternative as discussed in Section 4.2, but the likelihood of dam failure would be less, based on design and modern construction methods.

Water Utility Rates - As discussed previously, Mt. Werner and the City have changed to a metered rate structure. No further rate changes beyond those discussed are anticipated for either the City or Mt. Werner under Alternative B.

Reservoir Financing - Under the proposed reservoir financing strategy, discussed in Section 3.4, Mt. Werner would pay for 75 percent and the City would pay for 25 percent of the total reservoir expansion costs of approximately $6,000,000. This equates to a unit cost of approximately $2,600 per AF of storage. The water storage capacity received by each entity would be proportional to the share of the project for which each entity pays.

Neither Mt. Werner nor the City would increase water rates beyond the current rate changes or increase property taxes to pay for the proposed expansion. Mt. Werner would pay for its portion of the proposed $6,000,000 expansion through user fees and a City rebate and the City anticipates that it would pay for its share through general fund sales tax revenues.

Mt. Werner would fund approximately 23 percent ($1,370,000) of the total cost up front from its reserve funds. The remainder of the project ($4,630,000) would be funded with a 20-year loan from the Colorado Resources and Power Development Authority. Mt. Werner would begin to repay the loan immediately, while the City would begin to repay their share of the loan in eight years. This arrangement is appropriate since Mt. Werner's need for storage capacity is immediate and the City does not need additional storage capacity in the near future.

4.4.2.3 Alternative C - Smaller Reservoir Expansion

Socioeconomic Climate - As with Alternative A, the lack of water resources could potentially limit growth in the future under Alternative C. As discussed previously, if water availability begins to restrict growth, the cost of living in the community could increase. Additionally, under this alternative, the community might have to rely upon water sources of lesser quality.

Public Safety - Under Alternative C, an early warning system would also be installed to warn the community in the event of a dam failure. Furthermore, a remote control system would be installed to allow the City to respond to uninitiated changes in dam operation. Potential flood impacts associated with the Smaller Reservoir Expansion Alternative are greater than those associated with the No Action, and less than those associated with the Proposed Action as discussed in Section 4.2. However, the likelihood of dam failure would be reduced by the design and operation of the reservoir.

Water Utility Rates - As discussed previously, Mt. Werner and the City have changed to metered rate structures. No further rate changes beyond those discussed are anticipated for either the City or Mt. Werner under Alternative C.

Reservoir Financing - A similar financing arrangement would be developed for Alternative C as that discussed for Alternative B. Mt. Werner and the City would share in the total reservoir expansion costs of approximately $4,200,000. This equates to a unit cost of approximately $4,600 per AF of storage. While the overall cost of Alternative C is lower than the cost of Alternative B, the cost per AF of storage is higher by approximately 77 percent. The water storage capacity received by each entity would be proportional to the share of the project for which each entity pays. Additional water supplies would have to be developed, however, to meet the projected future demands of Mt. Werner. Expenditures to date of approximately 0.7 million dollars (for design) would be lost.

Neither Mt. Werner nor the City would increase water rates or increase property taxes to pay for Alternative C. Mt. Werner would pay for its portion of the $4,200,000 expansion through user fees and a City rebate and the City would pay for its share through general fund sales tax revenues.

For both Mt. Werner and the City, this $1,800,000 difference between the proposed and smaller reservoir expansions would be available for other purposes if Alternative C is selected. Mt. Werner would likely utilize the money for the development of a different water supply source and/or the construction of other capital improvement projects. Since the City's portion of the payment would be coming from the general fund, the City Council would likely re-prioritize its capital improvement projects. The money would not necessarily go towards water utility projects (Birch, 1992d).

4.4.3 Cumulative Impacts

With additional growth in the community, an eventual expansion of the water and wastewater treatment facilities is likely under all three alternatives. With growth comes an increase in water demand and the subsequent increase in wastewater loadings. These increases result in the need to expand the capacity of treatment facilities. Other infrastructure, such as water distribution and wastewater collection lines, may also require expanded capacity.

Cumulative impacts associated with a reduction in water demand (resulting from implementation of conservation measures) could include cost savings associated with the decrease in water and wastewater treatment volumes. Water and wastewater treatment operation and maintenance costs would be reduced and costly treatment plant expansions could be avoided. Additionally infrastructure capital and operation costs associated with the distribution of water and collection of wastewater could be reduced. With a metered billing rate, however, a reduction in water demand could also result in decreased water and wastewater utility revenues.

Growth pressures continue in Routt County, especially south of Steamboat Springs. Several major developments are in various stages of planning, including the Alpine Land and Catamount developments. As discussed in Section 3.4, continued growth in the area is expected to impact the present socioeconomic climate and quality of life experienced by the community.

4.4.4 Mitigation and Enhancement Summary

Possible mitigation includes the implementation of water conservation programs. Costs associated with water storage and construction of additional treatment capacity could potentially be reduced.

Additional mitigation includes the development of comprehensive 20-year water system master plans and wastewater system facility plans for the City and Mt. Werner. Water and wastewater utility system planning would define a service area and evaluate the most cost-effective water and wastewater system capital improvements required by the City and Mt. Werner to meet future needs within that service area. Additionally, such planning would allow for the thorough analysis of facility alternatives, institutional arrangements and cost distribution possibilities for future water and wastewater system development.

4.4.5 Unavoidable Adverse Impacts

Unavoidable socioeconomic adverse impacts under Alternative A would include the monetary losses associated with the interest payment on the loan for the Proposed Action, already secured by Mt. Werner. Additionally, expenditures to date of approximately one million dollars (for analysis and design) would be lost. If a lack of water restricts growth in the community, the cost of living in the community could increase. Additionally, under Alternative A, some community members might have to rely upon a water source of lesser quality. Under Alternative A, the absence of an early warning system and remote operational control systems would continue, as discussed previously in Section 4.2.

Under Alternative B, Mt. Werner would pay for 75 percent and the City for 25 percent of the proposed $6,000,000 reservoir expansion project.

Under Alternative C, the cost of living in the community could increase if a lack of water restricts growth. Additionally, the community might have to rely upon a water source of lesser quality than the Fish Creek source. Mt. Werner and the City would share in the cost of the $4,200,000 Alternative C expansion. Expenditures to date of 0.7 million dollars (for design) would be lost.

4.5 WETLANDS

4.5.1 Introduction

The following text presents a discussion of potential impacts to the wetlands resource. The impacts identified are those which can be expected to occur as a result of the proposed activities and alternatives detailed in Chapter 2. The potential for successful mitigation of impacts to wetlands is also discussed. Table 4-3, Wetland Acreage to be Impacted by Alternative, depicts the total acreages to be directly impacted by the various alternatives.

TABLE 4-3
WETLAND ACREAGE TO BE IMPACTED BY ALTERNATIVE

	Acreage Inundated	Acreage Filled
ALTERNATIVES		
Alternative A - No Action	0.00	0.00
Alternative B - Proposed Reservoir Expansion	15.00	0.00
Alternative C - Smaller Reservoir Expansion	0.00	0.00
BORROW AREA OPTIONS		
Borrow Area A-1 (Alternative B)	12.30*	0.00
Borrow Area A-1 (Alternative C)	6.60*	0.00
Borrow Area A-2	0.00	0.00
Borrow Area B	0.00	0.00
CAMPGROUND RELOCATION SITE OPTIONS		
Campground Relocation Site 1	0.00	0.00
Campground Relocation Site 2	0.00	0.00
Powerline	0.00	0.09
ROAD CORRIDOR OPTIONS		
Road Option #1	0.00	0.04
Road Option #2	0.00	0.37
Road Option #3	0.00	0.48
*Acreage included in corresponding reservoir expansion shoreline inundation		

4.5.2 Direct and Indirect Impacts

4.5.2.1 Alternative A - No Action

Under Alternative A, the project area would essentially remain in its existing state, supporting current land uses. The total acreage of wetlands and the characteristics of the plant communities would not likely change significantly in the future, barring any unforeseen site developments or alterations in recreation or grazing policy.

4.5.2.2 Alternative B - Proposed Reservoir Expansion

Under Alternative B, the primary impact to the wetlands resource would be the inundation of a portion of the wetlands surrounding the reservoir as a result of the planned increase in storage capacity. This inundation is a form of "filling" and is, therefore, considered to be an impact to be addressed. A total of approximately 15.09 acres of wetlands would be affected as a result of this Alternative. This acreage includes the wetland area to be inundated by the increased storage capacity

(15.00 acres) which includes wetlands within Borrow Area A-1. Approximately 0.09 acres would be disturbed by the proposed powerline construction. Campground Relocation Sites 1 and 2 would not directly effect any wetlands. Inundation and filling are considered to be direct, long-term impacts resulting in the permanent loss of the wetlands affected.

It should be noted that the avoidance of wetlands was incorporated into the design of the Proposed Action. Utilization of an upstream, rather than a downstream raise would avoid the filling of additional wetlands on the downstream side of the dam.

As a part of the proposed reservoir operation, discharges from the saddle dam through the Puppy Dog Lake spillway downstream would be reduced from higher historical levels to maximum discharges of approximately 20 cfs. Concern exists for the fate and dependence on historical flows of the wetlands located around the lake and along the drainage downstream.

Puppy Dog Lake is a natural lake that is thought to have formed from natural drainage, and possibly spring seep, prior to the construction of Fish Creek Reservoir. Saddle dam seepage and the yearly high flows released into the lake following reservoir construction have affected the development of wetlands around the lake circumference. The degree to which this has occurred and extended the historical wetland boundaries, if at all, is unknown. As a part of the Proposed Action, the saddle dam to be constructed would also be designed to seep, though not to the degree that the existing dam seeps, and flows through the lake would be reduced. The effect this Proposed Action will have on wetlands existing around the lake is unknown at this time. It is known that Puppy Dog Lake, given its natural position, will remain following construction and that wetlands will surround the lake shore and be fed by saddle dam seepage and planned discharges. It is reasonably certain that the wetland acreage would not increase as a result of the Proposed Action. The wetland acreage could, therefore, remain constant due to the natural position and hydrology of the lake itself, or decrease somewhat due to the reduction in flows to be released through the reservoir during the early spring. It is most likely that any wetlands to be lost would be those of a more transitional nature (to upland conditions) and be located upslope from the lake shoreline.

With regard to the wetlands downstream from Puppy Dog Lake, it is believed that lower flows would not result in a loss of these wetlands. Higher historical flows were extremely brief in nature and are not thought to be the basis upon which these wetlands developed. It is assumed that these wetlands developed primarily as a result of subirrigation and flooding due to normal flows through the channel. Though it has not been quantified, lower flows should serve to support the existing wetlands through continuing natural creek overflow and subirrigation processes.

One positive indirect impact could occur to the wetland resource as a result of Alternative B. Though the basic effect of inundation is a loss of wetlands, some wetlands surrounding the proposed new high waterline, may naturally form as a result of inundation in the same manner as some of the existing wetlands formed. The potential for this to occur and the characteristics those wetlands would assume, cannot be accurately quantified at this point in time.

4.5.2.3 Alternative C - Smaller Reservoir Expansion

A total of approximately 8.80 acres of wetlands would be affected under Alternative C as opposed to the 15.00 acres under Alternative B. The type and duration of this impact is considered to be the same as for Alternative B, with the exception that fewer wetland acres would be affected. Other impacts and the potential effectiveness of the proposed mitigation plan are the same for this alternative as for Alternative B, with one exception. With fewer impacted wetland acres to mitigate

for, a more selective approach might be possible with regard to choosing areas where upland/wetland conversions were employed, possibly resulting in a somewhat higher conversion success potential.

4.5.2.4 Borrow Area Options

Three borrow area options are being considered as a part of this project. The Borrow Area A-1 option would affect approximately 12.30 acres of wetlands under Alternative B and 6.60 acres of wetlands under Alternative C. This acreage is already included in the area to be inundated by reservoir expansion under these alternatives (see Sections 4.5.2.2 and 4.5.2.3). This would result in a net impact to wetlands of 0 acres. No wetlands would be impacted by Options A-2 and B since both of these areas consist entirely of uplands.

4.5.2.5 Campground Relocation Site Options

No wetlands would be affected as a result of the construction of the Campground Relocation Sites 1 or 2.

4.5.2.6 Road Corridor Options

Three road corridor options have been identified for this project. Road construction would result in the filling of various wetland acreages, depending upon the option, to create the required roadbed to achieve transportation objectives. The wetland acreage to be impacted by Road Corridor Options 1, 2, and 3 are 0.04, 0.37, and 0.48 acres, respectively. The acreage to be filled during construction under the option eventually selected would be included in the acreage to be mitigated for under the proposed wetland mitigation plan. Assuming wetland mitigation is successful, there would be no net loss of wetlands as a result of this project.

4.5.3 Cumulative Impacts

No wetland cumulative impacts have been identified.

4.5.4 Mitigation and Enhancements Summary

The Applicants have submitted a wetland mitigation plan (IME, 1992) to compensate for the wetlands to be lost as a result of project activities. It is proposed that "on-site, in kind" wetland creation activities serve as the basis of mitigation with off-site wetlands purchase/preservation a potential alternative mitigation procedure. Further evaluation of off-site mitigation will take place with the Forest Service, USFWS, and the COE. Wetlands would be created by modifying and revegetating existing upland sites at a ratio of 1.50 acres of created wetlands to 1.00 acres of wetlands disturbed by inundation or filling. Wetlands to be created would parallel, when possible, the types of wetlands to be affected by project activities. "In kind" wetland mitigation would be based on the use of Corps of Engineer's accepted evaluation procedures. A total of approximately 42 acres have been identified as potential mitigation sites. These sites are, for the most part, located near or adjacent to existing wetlands lending credence to the theory that hydrologic conditions exist or can be modified to support an upland-wetland conversion program. The revegetation techniques included in the mitigation proposal, including salvage and reapplication (at wetland mitigation sites) of wetland soils to be inundated or filled, reflect a potentially and technically successful approach to wetland mitigation. Assuming a successful mitigation program, there should be no net long-term loss of wetlands as a result of Alternatives B or C.

4.5.5 Unavoidable Adverse Impacts

Wetlands affected due to inundation or filling would be permanently lost as a result of the implementation of either Alternative B or C. The wetland mitigation plan, when fully implemented, would mitigate for this resource loss.

4.5.6 Irreversible and Irretrievable Commitment of Resources

Wetlands inundated or filled would be permanently lost under Alternatives B or C.

4.6 SOILS

4.6.1 Introduction

The following text presents a discussion of potential impacts of the alternatives to the soils resource. The primary impacts that would occur include loss of soil productivity and an increase in the potential for erosion. Impacts to vegetation productivity, directly related to impacts to soil productivity, are treated in more detail in Section 4.7, Vegetation. Concerns related to potential erosion hazards for the soils impacted, are presented in the text in conjunction with a discussion of reclamation potentials.

Table 4-4, Soil Map Units Impacted, depicts the acreage of soil types to be directly affected by the project alternatives.

TABLE 4-4
SOIL MAP UNITS IMPACTED BY ALTERNATIVE

	Map Unit Number			
	44	74	75	612C
ALTERNATIVES				
Alternative A - No Action	0.0	0.0	0.0	0.0
Alternative B - Proposed Reservoir Expansion	7.0	0.0	5.6	38.8
Alternative C - Smaller Reservoir Expansion	5.9	0.0	5.6	22.9
BORROW AREAS				
Borrow Area A-1 (Alternative B)*	0.0	0.0	0.0	27.4
Borrow Area A-1 (Alternative C)*	0.0	0.0	4.3	21.6
Borrow Area A-2	0.0	0.0	0.0	2.5
Borrow Area B	8.4	13.5	0.4	1.5
CAMPGROUND RELOCATION SITE OPTIONS				
Campground Relocation Site 1	0.0	0.0	2.6	4.3
Campground Relocation Site 2	0.0	0.0	0.4	0.0
ROAD CORRIDOR OPTIONS				
Road Option #1	0.3	0.0	0.4	0.0
Road Option #2	0.3	0.6	0.5	0.2
Road Option #3	0.3	0.2	0.7	0.4
POWERLINE	2.0	0.0	0.0	0.2

*Acreage included in corresponding reservoir expansion shoreline inundation

4.6.2 Direct and Indirect Impacts

4.6.2.1 Alternative A - No Action

Under Alternative A, the project area would essentially remain in its existing state. Future impacts to soils would parallel existing impacts. Natural erosion rates and soil productivities would mirror those occurring at this time, assuming that land management policies and uses of the project area do not change significantly in the future.

4.6.2.2 Impacts Common to All Action Alternatives

Impacts to the soil resource, under Alternatives B and C, include those which would affect the chemical and physical nature of the endemic soils as well as the volumes available for reclamation. Soil chemical and physical parameters would be permanently modified as a result of a soil reclamation program. Soil horizons would be mixed during salvage resulting in a blending of characteristics as compared to the soils in their natural state. Assuming that only soils suitable for reclamation would be salvaged, blending should not result in the degradation of soil resources in terms of reclamation potential. Soil chemistry would also be modified through soil stockpiling as anaerobic conditions within the stockpiles develop. Soil chemical changes due to stockpiling are considered to be short-term and redeemable to a level commensurate with adequate vegetation establishment following re-soiling. A soil sampling and analysis program should adequately address the soil chemistry concern and limit this impact to the short-term. Isolated spill accidents, should they occur, could result in minor soil contamination from oils, solvents, etc. Such spills would normally result in soils deemed unsuitable for reclamation. Soils so affected can be buried to effectively reduce the effects of this impact. The volume of soil subject to spills should be limited and no impact to revegetation potential would be anticipated.

4.6.2.3 Alternative B - Proposed Reservoir Expansion

Approximately 60.6 acres of soils would be directly impacted by either inundation, removal for fill, or surface disturbance as a result of Alternative B. Inundation would affect 51.4 acres as a result of increasing the reservoir storage capacity corresponding with a raised shoreline elevation. Included in this total are the 36.2 acres of disturbance associated with Borrow Area A-1. It is assumed that the majority of soils associated with Borrow Area A-1 would be used in the construction of the proposed dams and associated facilities thereby rendering a permanent loss of these soils in terms of vegetation productivity. The majority of the remaining 15.2 acres of soils would be inundated and similarly affected in terms of lost production. Construction of the proposed campground would impact a maximum of 7.0 acres of soils. Impacts would be limited to surface and upper subsurface soil horizons as a result of parking lot, trail, and camp site construction. Overall, the impacts to soils would be limited primarily to a permanent loss of a very small, but undetermined, acreage of soil productivity due to a change in land use. Soil erosion could occur to a very limited extent until surface disturbances were stabilized. Given that the revegetation potentials of the vast majority of soils to be affected (map units 44, 75, 612C) are "moderate" and the disturbances planned are small, soil erosion is considered to be a limited, short-term, mitigable impact.

A maximum of 2.2 acres of soils would potentially be disturbed as a result of powerline construction. Considering that soil disturbance would likely be limited to the trench in which the line is laid and the area immediately surrounding the trench, the acreage to be disturbed should be significantly less. Assuming that soil materials are returned to the trench as a part of the

construction process, the impacts to soils are limited to a brief period of reduced productivity until the trench disturbance is revegetated.

4.6.2.4 Alternative C - Smaller Reservoir Expansion

A total of approximately 29.6 acres of soils would be affected under Alternative C as opposed to the 51.4 acres under the Alternative B. Discounting the 25.9 acres of borrow source soils discussed below under subsection 4.6.2.5, a net total of 3.7 acres of soils would be lost to inundation as compared to a net of 15.2 acres of soils under Alternative B. The type and duration of this impact, as well as the positive aspects of 8.8 acres of wetland soil salvage, is considered to be the same as for Alternative B with the exception that fewer acres of soils would be affected.

4.6.2.5 Borrow Area Options

Borrow Area A-1, under Alternative C, would affect approximately 25.9 acres of soils as compared to the 36.2 acres under Alternative B. These soils, with the exception of 6.6 acres of wetland surface soil materials, would be salvaged from the borrow site and used as fill during construction. The area from which the soils were removed would then be inundated. The productivity of the soils to be affected would be permanently lost. The small volume of salvaged wetland soil material would be used to aid in mitigating the loss of wetlands. As such, the productivity potential of this material would be retained. Borrow Area A-2 encompasses approximately 3.0 acres, of which the majority is rock outcrop. Borrow Area B consists of approximately 23.4 acres. A portion of this acreage was previously disturbed for fill materials at an earlier date and consists of a borrow pit undergoing natural revegetation. The Applicant has not submitted a revegetation plan, including a soil salvage and handling plan, for these borrow areas. Therefore, a discussion of the impacts to soil productivity and soil erosion potential, or an assessment of the potential for successful reclamation, is not possible at this time. The Applicants do indicate that these disturbances would be resoiled and seeded, but there is no information, especially in terms of soil volumetrics, to indicate that sufficient soil would be salvaged and reapplied to disturbed areas to support a stable, productive, post-disturbance vegetation community. Therefore, it is assumed that the majority of the productivity of the endemic soils overlying the borrow areas (excluding rock outcrop areas) would be lost and that erosion would increase to an undefined degree over that occurring naturally.

4.6.2.6 Campground Relocation Site Options

Construction of Campground Relocation Site 2 would impact a maximum of 5.3 acres of soils as compared to the 7.0 acres under Campground Relocation Site 1 (see Figure 2-5). The impacts to Campground Relocation Site 1 would be limited to surface and subsurface soil disturbances resulting in a loss of soil vegetation production and a potential for limited erosion. The primary soil (Map Unit 74) to be affected under Campground Relocation Site 2 has a somewhat higher water erosion hazard and lower revegetation potential than the primary soils (map units 75 and 612C) to be affected under Campground Relocation Site 1 indicating a potential for greater (though very limited) soil losses due to erosion until surface stabilization is achieved.

4.6.2.7 Road Corridor Options

Soil acreage to be affected by Road Options 1, 2, and 3 are 1.4, 1.6, and 1.6 acres, respectively. Soil erosion hazards are somewhat higher, and revegetation potentials slightly lower, for Option 1 as compared to Options 2 and 3, due to the relative acreage of Map Unit 74 being affected among the road corridor options (see Table 4-4). Conversely, the predominance of the low productivity soils

of Map Unit 74 along Road Corridor Option 1 as compared to the higher productivity soils of Road Corridor Options 2 and 3 indicate that less potential soil productivity would be lost as a result of the selection of Road Corridor Option 1. Given a regional perspective and assuming that Forest Service road stabilization and revegetation requirements are followed, there is little overall difference between road corridor options in terms of the effect to soil productivity and the potentials for soil stabilization.

4.6.3 Cumulative Impacts

No cumulative soil impacts have been identified.

4.6.4 Mitigation and Enhancements Summary

Surface soil horizons from approximately 8.8 (Alternative C) to 15.0 acres (Alternative B) to be inundated would be salvaged as a part of the wetland mitigation program and reapplied to wetland mitigation sites. The productivity value of the salvaged soils would be retained as a result of the reclamation program.

4.6.5 Unavoidable Adverse Impacts

Under Alternatives B and C, minor losses of soil materials suitable for revegetation would occur during salvage operations due to innate equipment inefficiencies. Soil erosion on regraded and resoiled areas would likely occur to a small degree, until vegetation has become fully established and reclamation is successful.

4.6.6 Irreversible and Irretrievable Commitment of Resources

Under Alternatives B and C, soil materials not salvaged for revegetation would be lost as a result of inundation, use as fill, or burial beneath the roadbed during road construction.

4.7 VEGETATION

4.7.1 Introduction

This section details the potential impacts of the project alternatives on the vegetation resources proximal to the existing reservoir. Measurable effects of the Proposed Action on vegetation resources more distant are not anticipated and, therefore, will not be addressed in this document. The impacts identified are those which can be reasonably expected to occur as a result of the implementation of alternatives detailed in Chapter 2. The direct effects of the project to one particular vegetation community, wetlands, is separately discussed in Section 4.5, owing to that community's particular importance with regard to Corps of Engineers permitting requirements.

Because the potential impacts to vegetation as a result of project evolution are directly related to physical disturbances, no adverse effects could be considered common to all alternatives with the exception of a small amount of disturbance due to powerline burial. However, two important conditions are common to all alternatives. These conditions are that no impacts are anticipated as a result of project construction and operation to: 1) threatened, endangered, or sensitive plant species, or; 2) to the grazing management of the area. These conditions exist due to the management of the grazing allotment (restriction of grazing etc. within 500 feet of the reservoir), and the fact that no

sensitive species were discovered during intensive search efforts in the vicinity of the reservoir (see Section 3.7).

4.7.2 Direct and Indirect Impacts

4.7.2.1 Alternative A - No Action

Under Alternative A, the project area would remain in its existing state supporting current land uses. Impacts of the existing reservoir on the vegetation resources have already been realized and would not be expected to change in the foreseeable future barring any unforeseen site developments or alterations in recreation or grazing policy.

4.7.2.2 Alternative B - Proposed Reservoir Expansion

Assuming implementation of Alternative B, the primary impact to the vegetation resources would be the inundation of a portion of each of those communities proximal to the reservoir. The acreage which would be lost due to inundation is presented on Table 4-5, Potential Disturbed Acreage By Vegetation Type. Therefore, as noted in this table, 51.4 acres of vegetation would be lost as follows: 15.0 acres (29%) of wetland, 19.1 acres (37%) of upland meadow, 12.0 acres (23%) of mixed conifer, and 5.3 acres (11%) of previously disturbed ground. The proposed borrow source, area A-1, would affect 35.9 acres, however, about three-quarters of this acreage would be inundated. The remaining one-quarter, is predominantly upland meadow with some mixed conifer. Finally, the proposed powerline would potentially affect an additional 2.2 acres of vegetation located along the Fish Creek Access Road. Any of the three road corridor options would affect about one and one/half acres. In total, the proposal would disturb approximately an additional 71 acres of vegetation (including 5.5 acres of previous disturbance) over current conditions.

TABLE 4-5
POTENTIAL DISTURBED ACREAGE BY VEGETATION TYPE

	Wetlands	Upland Meadow	Mixed Conifer	Disturbed Areas	Total Acreage
ALTERNATIVES					
Alternative A - No Action	0.0	0.0	0.0	0.2	0.0
Alternative B - Proposed Reservoir Expansion	15.0	19.1	12.0	5.3	51.4
Alternative C - Smaller Reservoir Expansion	9.9	10.7	6.1	3.8	29.5
BORROW AREA OPTIONS					
Borrow Area A-1 - (Alternative B)	12.3	12.0	7.9	3.7	35.9
Borrow Area A-1 - (Alternative C)	6.6	10.7	6.3	2.2	25.8
Borrow Area A-2	0.0	0.7	2.3	0.0	3.0
Borrow Area B	0.0	9.5	13.7	0.2	23.4
CAMPGROUND					
Campground Relocation Site 1	0.0	3.3	3.6	0.0	6.9
Campground Relocation Site 2	0.0	0.0	4.8	0.0	5.3
ROAD CORRIDOR OPTIONS					
Road Option 1	0.09	0.24	1.21	0.00	1.49
Road Option 2	0.37	0.50	0.82	0.00	1.69
Road Option 3	0.48	0.40	0.71	0.02	1.61
POWERLINE	0.09	0.91	0.91	0.21	2.18

*Most of the proposed disturbance to borrow area A1 would be inundated and, therefore, is not additive with other disturbances.

Of note with regard to loss of mixed conifer vegetation, is the associated loss of timber resources. As indicated in Section 3.7, tree density was estimated at about 450 stems per acre. However, because of the small acreage (20± acres) and marginal sawtimber involved, the effect on timber resources is less marked. These resources may be salvaged prior to construction. Salvage would consist of some potential sawtimber and polestock, but primarily firewood. Owing to the mixed heights and species involved (for which data were not collected), an accurate estimate of sawtimber, poles, or cordwood cannot be made.

4.7.2.3 Alternative C - Smaller Reservoir Expansion

Alternative C would involve a reduced increase in capacity over that of Alternative B. A total of approximately 29.5 acres of vegetation would be affected as opposed to the 51.4 acres under Alternative B. Because of relatively equal distribution around the current reservoir, the proportionate decrease would be nearly equal among the four affected vegetation types. Although the amount of overall disturbance would be less with Alternative C, the proportion of Borrow Area A-1 that could be inundated would be reduced from three-quarters to about one-half. Therefore, the net effect of Alternative C would only be a reduction of approximately 20 acres of vegetation disturbance.

4.7.2.4 Borrow Area Options

Given the differences regarding inundation of Borrow Area A-1 depending on reservoir alternative, the potential disturbance to remaining vegetation types of borrow areas would become additive depending on need for rip-rap or other fill material. Therefore, as much as 12.3 acres of wetlands could be disturbed in the borrow areas. In a similar manner, 32.9 acres of upland meadow, 30.2 acres of mixed conifer, and 6.1 acres of previously disturbed ground could be disturbed as need for particular fill material is realized.

A commitment has been made by the project Applicant to retopsoil and reseed with native grasses all disturbed borrow areas. Because no detail has been provided to allow an evaluation of the feasibility of this commitment and potential for success, two possible outcomes may result. First, the reclamation attempt may be successful and in such a situation, long-term effects of borrow removal would be limited to loss of existing timber resources. Conversely, the reclamation attempt could fail resulting in long-term loss of vegetation communities disturbed. In this latter circumstance, impacts would go beyond the long-term loss of vegetation resources and include degraded visual resources.

4.7.2.5 Campground Site Relocation Options

Campground Relocation Site 1 would affect 6.9 acres of vegetation about equally split between upland meadow and mixed conifer. Campground Relocation Site 2 would affect 1.6 fewer acres than Site 1, but the same two communities would be affected, upland meadow and mixed conifer. However, Site 2 would affect more mixed conifer vegetation than the proposed site, 4.8 acres versus 3.6 acres.

4.7.2.6 Road Corridor Options

As indicated, three road corridor options have been identified for this project, and road construction would result in the disturbance of various acreages of vegetation communities, depending upon the road corridor option. As indicated in Table 4-5, Road Corridor Option 1 affects the least acreage

(including wetlands), but would impact the most mixed conifer. Option 2 would affect the most acreage including 0.37 acres of wetland and 0.82 acres of mixed conifer. Road Corridor Option 3 would affect median acreage, the least mixed conifer (0.71 acres), and the most wetland (0.48 acres).

4.7.3 Cumulative Impacts

Under all three alternatives, (A, B, and C) more trampling by recreationists and displacement of vegetation would occur with increased human use of the area.

4.7.4 Mitigation and Enhancements Summary

In addition to the wetlands mitigation discussed in Section 4.5.4, under Alternatives B and C, disturbed areas would be regraded and reseeded with a native grass mixture.

4.7.5 Unavoidable Adverse Impacts

Under Alternatives B and C, existing vegetation communities affected by inundation or facility construction would be permanently lost. Reclamation of disturbed borrow areas could return these areas to aesthetically pleasing and functioning vegetation communities.

4.7.6 Irreversible and Irretrievable Commitment of Resources

Acreage which would be inundated by the proposed expansion would be irreversibly committed to water storage. As a result, this acreage would no longer be available to support wetlands, upland meadows, or coniferous forest. Likewise, new roads that are developed would commit resources for the long-term unless reclaimed. Furthermore, timber resources currently existing proximal to the reservoir would also be irretrievable once harvested.

4.8 WILDLIFE/FISHERIES

4.8.1 Introduction

This section addresses potential direct and indirect impacts that would be associated with the alternatives addressed by this EIS. These impacts are discussed below for all wildlife, with particular emphasis placed on potential effects to wildlife species of concern including:

- Big game
- Raptors
- Trout
- and Federal Threatened, Endangered, or Candidate species

4.8.2 Direct and Indirect Impacts

4.8.2.1 Alternative A - No Action

Under the Alternative A, the project area would essentially remain in its existing state. As a result, future habitat conditions and wildlife use of the project area would be similar to those currently existing at the reservoir site, assuming there are no major alterations in current land use activities. Stream habitat in the Puppy Dog Lake channel would continue to be degraded by high spring flows, and no long-term fisheries pool would be maintained for fisheries in the reservoir itself.

4.8.2.2 Impacts Common to All Action Alternatives

The potential impacts of Alternatives B or C on wildlife populations can be classified as short-term and long-term. Short-term impacts arise from habitat disturbance as well as from construction activities associated with reservoir expansion. These impacts cease upon completion of reservoir expansion and successful reclamation of non-inundated disturbance areas. Long-term impacts consist of permanent habitat changes associated with disturbed and inundated areas irrespective of reclamation success. The major impact categories which would potentially affect wildlife populations are direct habitat removal or alteration and increased human presence and noise.

Direct Habitat Loss or Alteration - The greatest impact to all wildlife would be the temporary or permanent loss or alteration of habitat. Temporary loss or alteration of habitats would be caused by construction of enlarged dam areas; transportation corridors; a new campground site; inundation by the expanded reservoir; and excavation at borrow sites. Habitat loss or alteration would result in minor losses of smaller, less mobile species of wildlife, such as small mammals and reptiles, and displacement of more mobile species to adjacent undisturbed habitats until construction and reclamation is completed. Existing information regarding wildlife population numbers for these animal groups within the project area is not available, and the magnitude of wildlife losses and displacement is impossible to predict. However, the total extent of habitat loss can be addressed. Long-term or permanent loss or alteration of habitat would result if reclamation efforts cannot return disturbed areas to conditions similar to those that were present prior to mining. Where reclaimed and unreclaimed habitats support less productive and less diverse vegetation communities than those present prior to project development, the long-term impacts would be negative with regard to re-establishment of wildlife populations to existing condition levels. Areas inundated by the proposed reservoir expansion would result in permanent losses in terrestrial and small stream habitats around the perimeter of the existing reservoir and a gain aquatic lake habitat. Transportation corridor, borrow area, and new campground disturbances would be primarily short-term and be mitigated by reclamation following construction completion. However, based on past reclamation efforts on existing borrow areas, newly reclaimed borrow areas are not expected to return to existing levels of vegetation diversity and productivity.

Acreage of disturbed habitat are listed for each development alternative in Table 4-5, Potential Disturbed Acreage by Vegetation Type. Differences in the extent of disturbance and habitats affected relate principally to differences in reservoir expansion size and in the location of transportation corridors, borrow sources, and the relocated campground site.

No loss of critical or important habitat for any Federally listed Threatened, Endangered, or Proposed species would occur with Alternatives B or C. The endangered bald eagle and American peregrine falcon occur in the region, but no nesting or important foraging habitat of these species would be affected with reservoir expansion (see Biological Assessment, Appendix J) . Four endangered fish species (Colorado squawfish, humpback chub, bonytail chub, and razorback sucker) occur downstream of the project area in the Colorado River and its mainstem tributaries. Populations and habitats of these species would not be directly affected by expansion of the Fish Creek Reservoir, but resultant modifications in the timing and quantity of water releases from Fish Creek Reservoir could result in relatively minor changes in downstream flow regimes which could affect these species (see Biological Assessment, Appendix J).

Direct habitat loss has the potential to affect four Federal Candidate (C2) species (wolverine, lynx, northern goshawk, and boreal toad) and one state listed Threatened species (wood frog). It is also possible that additional habitat could be created for another Federal Candidate (C2) species, Colorado

River cutthroat. Other species of concern potentially affected by habitat loss include big game (elk and mule deer), raptors, and brook trout.

Wolverine and lynx prefer high mountain areas and suitable habitats occur in the vicinity of the project area. Scattered unconfirmed sighting of wolverine have been made near the project area, but no observations of lynx have been recorded. Both species are wide-ranging and may possibly occur in the general area. However, the reservoir site would represent a very small proportion of their range and proposed disturbance areas do not represent preferred habitats for these species. Therefore, reservoir expansion is not expected to result in any negative impacts to wolverine or lynx populations.

Northern goshawks nest in mature and old-growth coniferous forest. Old-growth forest habitats with a relatively open understory are preferred. Nesting birds are relatively intolerant of human disturbance. Recreational activities and the current lack of old-growth habitats in the vicinity of Fish Creek Reservoir reduce the potential for any goshawk nesting use of the project area. No nests or evidence of goshawk nesting activity (pluck sites, whitewash, or pellets) were observed in proposed disturbance areas. A single observation of a northern goshawk during the 1992 field surveys indicates that goshawks may occasionally use the project area for hunting. The reservoir expansion may result in a slight reduction in available hunting habitat for northern goshawk, but no loss of suitable nesting habitat would occur.

As indicated in Section 3.8, Wildlife, suitable boreal toad breeding habitat, consisting of shallow water wetland areas, exist within the project area, although no boreal toads were observed during the 1992 field surveys. Field review of proposed disturbance areas did not identify any suitable breeding habitat within the borrow, transportation corridor, or campground sites. However, the reservoir expansion would inundate potential boreal frog breeding habitat adjacent to the east end of the reservoir. Suitable habitat within the inundation area consists of small, shallow pools associated with wetland habitats along Granite Creek and other small springs feeding the reservoir. Only a small portion of these wetlands contains pool areas suitable for breeding. The portion of Middle Fork Fish Creek to be inundated has too steep a gradient and does not support suitable boreal toad breeding habitat.

Wood frogs prefer shallow, natural ponds, supporting extensive growth of sedges in shallow water areas and lacking a permanent inlet or outlet, for breeding. Shallow ponds in upland meadow habitat in the vicinity of the reservoir represent suitable breeding habitat for these species. No wood frogs were located during field surveys, and no shallow pools in upland meadow areas would be disturbed by reservoir expansion activities. Adverse impacts to wood frog populations are not expected with reservoir expansion.

The Colorado River cutthroat currently does not occur within the waters of the project area, but suitable habitat is present. As indicated in Section 3.8, Wildlife, dam and spillway construction associated with reservoir expansion would isolate the reservoir and its feeder streams from fish movement below the reservoir. As a consequence, the Colorado Division of Wildlife (CDOW) could consider restoring Colorado River cutthroat into Fish Creek Reservoir and its upstream drainages sometime in the future. However, the CDOW considers Fish Creek Reservoir to be a low priority introduction site because of relatively easy public access, high public recreational use of the area, and operation of the reservoir as a municipal water supply (Sealing, 1992).

The project area occurs within elk and mule deer summer range, and project development would result in a slight reduction of summer range in the region. Permanent habitat loss would occur in the areas inundated by the expanded reservoir. Additionally, new roads would account for a minor amount of relatively permanent habitat loss. It is also projected that vegetation in the borrow areas would not be returned to pre-disturbance diversity and productivity levels. Therefore, lost carrying capacity or displacement from these areas would continue after construction.

These habitat losses and reductions in habitat quality, however, are not expected to have any measurable effect on regional elk and mule deer populations because summer habitats are not considered limiting for these species, and existing recreational activities in the vicinity of the reservoir have already limited the suitability of existing habitats.

As indicated in Section 3.8, Wildlife, a variety of forest birds of prey occur and nest in the region. Nesting habitat for most species is limited in the project area by the general lack of suitable tree or cliff nest sites. In addition, no old-growth forested habitat, preferred for nesting by species such as pygmy owl and boreal owl, would be disturbed by reservoir expansion. As a result, project development is expected to have little effect on regional populations of nesting raptor species.

Fisheries habitat would be affected by the reservoir expansion. Reservoir expansion would create additional high mountain lake habitat but would reduce the amount of available stream habitat in Middle Fork Fish Creek and Granite Creek above the reservoir. The greatest amount of inundation would occur along Granite Creek since its gradient is less steep than Middle Fork Fish Creek. Because of the steepness of Middle Fork Fish Creek in most of the inundation area there are few pools, and trout habitat was rated as relatively poor. In contrast, the portion of Granite Creek which would be inundated exhibits characteristics of a mountain meadow stream with numerous deep pools. This section of the stream provides high quality trout habitat and supports numerous, but small, brook trout.

Human Presence and Noise - Increased levels of human activity and noise associated with construction activities related to reservoir expansion has the potential to displace local wildlife populations beyond the actual areas of habitat disturbance. The most common response of wildlife to noise and human presence is avoidance or accommodation. Reaction of animals to noise varies depending on the intensity of the noise source and whether it is continuous or intermittent. Transient loud noises generally provoke alarm responses, while many animals apparently learn to ignore more constant, lower level noise sources that are not associated with negative experiences such as being chased or hunted. Avoidance would result in displacement of animals from an area larger than the actual disturbance area.

The total extent of habitat lost as a result of wildlife avoidance response is impossible to predict since the severity of this response varies from species to species and can even vary between different individuals of the same species. Also, after initial avoidance of human activity and noise producing areas, certain wildlife species may acclimate to the activity and begin to reinvade areas formerly avoided. Since the project area already receives considerable human recreational activity, additional wildlife avoidance in response to construction activities is expected to occur only in the immediate area of construction activity. This avoidance should be relatively short-term and cease shortly after construction is completed.

In addition to avoidance response, increased human presence intensifies the potential for wildlife/human interactions ranging from harassment of wildlife to poaching and legal harvest. Possible impacts from poaching can be alleviated by prohibiting the possession of firearms by the

construction crew within the project area. Posting state hunting and fishing regulations at a conspicuous place on the job site and making violation of regulations grounds for dismissal would also reduce the chance of game and fishery violations.

Increased human presence and related increases in traffic levels on project access roads also increases the potential for wildlife/vehicle collisions. Construction related to reservoir expansion would require a 30-person crew for two seasons from late May to October. It is projected that, during the two construction periods, there would be an average increase in round-trip traffic of 15 vehicles per day on project access roads. Peak traffic levels would be 30 vehicles per day. If a construction camp is established at the project site, traffic levels would average 7 vehicles per day with a peak of 15 vehicles per day. The potential for wildlife/vehicle collisions is typically highest in the early morning and evening hours and where roads traverse ranges or areas where mule deer or elk congregate. The potential for an increase in wildlife/vehicle collisions is unknown but is expected to be low for two reasons. First, construction would not be initiated until after mule deer and elk have begun to disperse from winter concentration areas at the lower elevations. Second, vehicle speeds along most of the access route would be relatively slow due to the steepness of the route and the rough road surface.

4.8.2.3 Alternative B - Proposed Reservoir Expansion

Alternative B disturbs the greatest amount of upland, wetland, and stream habitats. The expanded reservoir area would permanently inundate 36.4 acres of terrestrial habitat and 15 acres of wetland habitat for a total loss of 51.4 acres. Due to the relatively small losses of habitat and heavy recreational use in the vicinity of the reservoir, the reduction in upland and wetland habitats is not expected to have any measurable effect on local terrestrial wildlife populations. Disturbance to other terrestrial habitats by construction activities would be relatively short-term, and effects on local wildlife populations from these disturbances would also be negligible. With the Borrow Source A-1 option approximately 45 acres would be disturbed by construction activities related to the dam enlargement, new campground, and roads. However, 28 acres of Borrow Area A-1 would be inundated by the expanded reservoir so construction activities would account for only about 18 acres of additional total disturbance.

Within wetland areas to be disturbed, approximately 260 feet of Middle Fork Fish Creek and 1,350 feet of Granite Creek would be inundated by reservoir expansion Alternative B. Loss of stream habitat above the reservoir would be mitigated to some extent by agreements which would improve fisheries habitat and maintain minimum in-stream flow in lower Fish Creek. The CDOW may be interested in improving recreational fishing in the reservoir by stocking catchable sized fish as well as fry (Sealing, 1992). The expanded reservoir would have sufficient capacity to maintain a fisheries pool at maximum drawdown. A fisheries pool would also enhance the viability of the fishery and improve recreational fishing opportunities.

4.8.2.4 Alternative C - Smaller Reservoir Expansion

This alternative involves a smaller expansion than that proposed under Alternative B. With Alternative C, reservoir expansion would inundate an additional 29.5 acres of upland and wetland habitats, as compared to 51.4 acres for Alternative B. As with Alternative B, the majority of habitat loss would involve wetland, upland meadow, and mixed conifer habitats (see Section 4.7, Vegetation). With the Borrow Source A-1 option, approximately 34 acres would be disturbed by construction activities related to the dam enlargement, new campground, and roads. However, approximately 13

acres of Borrow Area A-1 would be inundated by the expanded reservoir so construction activities would account for only about 21 acres of additional total disturbance.

Within wetland areas to be disturbed, approximately 130 feet of Middle Fork Fish Creek and 390 feet of Granite Creek would be inundated by Alternative C. Mitigation agreements which would improve fisheries habitat and maintain minimum in-stream flow in lower Fish Creek under Alternative B would not apply to Alternative C. In addition, with smaller reservoir expansion, there would not be sufficient reservoir capacity to maintain a fisheries pool during maximum drawdown periods.

4.8.2.5 Borrow Area Options

Three borrow area options are being considered as a part of this project. As indicated above surface disturbance associated with Borrow Area A-1 would be dependent on which reservoir expansion alternative is selected. The potential disturbance to terrestrial habitats by use of optional Borrow Areas A-2 and B would become additive depending on need for rip-rap or additional fill material for either reservoir alternative. Therefore, as much as an additional 26.4 acres could be disturbed through use of Borrow Areas A2 and B. The majority of this disturbance (26.2 acres) would occur in upland meadow and mixed conifer habitats (see Section 4.7, Vegetation). Neither additional borrow area (A2 or B) would affect any additional wetland habitat.

The Applicants have committed to replace topsoil and reseed with native grasses all disturbed borrow areas. However, no details have been provided to allow an evaluation of the feasibility of this commitment and potential for success. Therefore, it is assumed that the majority of the productivity of the endemic soils overlying the borrow areas (excluding rock outcrop areas) would be lost, and vegetation diversity and productivity would not be returned to pre-existing conditions. As a result there would be a long-term loss in habitat quality in the borrow source areas.

4.8.2.6 Campground Relocation Site Options

Campground Relocation Site 2 would affect 1.6 fewer acres of upland habitat than Campground Relocation Site 1. Upland meadow and mixed conifer habitats would be the only habitats affected by either campground option. However, Site 2 would affect more mixed conifer habitat (4.8 acres versus 3.6) and less upland meadow habitat (0.5 acres versus 3.3) than Site 1.

4.8.2.7 Road Corridor Options

As indicated, three road corridor options have been identified for this project. Each road construction option would result in relatively minor differences in habitat disturbance. Road Corridor Option 1 affects the least acreage (1.49 acres), including wetlands, but would impact the most mixed conifer habitat. Road Corridor Option 2 would affect the most acreage (1.69 acres), including 0.37 and 0.82 acres of wetland and mixed conifer habitats, respectively. Road Corridor Option 3 would affect slightly less habitat (1.61 acres) than Option 1. It would also affect the least amount mixed conifer habitat (0.71 acre) and the most wetland habitat (0.48 acre).

4.8.3 Cumulative Impacts

Under all three alternatives (A, B, and C), greater use of the area would result in further displacement of wildlife.

4.8.4 Mitigation and Enhancements Summary

Under all alternatives, (A, B and C), Fish Creek Reservoir would be restocked.

4.8.5 Unavoidable Adverse Impacts

Existing terrestrial and stream habitats affected by inundation or by campground and road construction would be permanently lost as a result of the implementation of Alternatives B or C. Mitigation in the form of habitat improvement and maintenance of minimum stream flow in Fish Creek would somewhat mitigate stream habitat losses associated with Middle Fork Fish Creek and Granite Creek. Reclamation of disturbed borrow areas would revegetate these disturbances, but it is unlikely that reclaimed borrow areas would support vegetation as productive and diverse as that existing prior to disturbance.

4.8.6 Irreversible and Irretrievable Commitment of Resources

Terrestrial and stream habitats inundated by the proposed expansion would be irreversibly committed to water storage and converted to lake habitat. New roads that would be developed would also commit habitat resources for the long-term unless reclaimed.

4.9 RECREATION

4.9.1 Introduction

Fish Creek Reservoir, although accessible by car, is a fairly remote recreation area with a limited amount of developed facilities. For these reasons, the reservoir provides a rather pristine and uncrowded recreation setting, even when the campground is full. Although use can become concentrated on the weekends, the campground's low capacity and poor access protects the nature of the recreational setting. Visitors have come to appreciate the solitude afforded to them at the reservoir, making Fish Creek Reservoir a valued recreational resource.

The scope of this discussion consists of potential impacts to developed and dispersed recreational resources defined in Section 3.9, Recreation. The primary study area refers to Fish Creek Reservoir and its immediate surroundings, while the secondary study area refers to other resources in the Routt National Forest that could be indirectly affected by the proposed reservoir expansion. Study area boundaries and the location of recreational resources are shown in figures presented in Section 3.9.

4.9.2 Direct and Indirect Impacts

4.9.2.1 Alternative A - No Action

Under Alternative A, the existing campground and facilities would remain.

4.9.2.2 Alternative B - Proposed Reservoir Expansion

Short Term Impacts - The proposed expansion of Fish Creek Reservoir under Alternative B, would affect primarily the summer-use season. The expanded shoreline would inundate Granite Campground (4 campsites and picnic tables), a parking lot, and a user-created trail that circles the reservoir. Because these facilities would be replaced as part of project mitigation, the loss of developed and dispersed recreation resources at Fish Creek Reservoir would be temporary and would

coincide with the proposed 2-year construction plan. Thus, as a result of the construction phase of the project, recreationists who visit Fish Creek Reservoir for dispersed and developed recreation would be temporarily displaced.

Granite Campground currently records approximately 1,000 Recreation Visitor Days (RVD's) each summer (USDA, 1992). The primary study area is also commonly used by anglers, mountain bikers, hikers, and hunters. As a result of the temporary displacement of these visitors, recreational resources in the secondary study area such as campgrounds, trails, lakes, and parking facilities would be indirectly impacted by the expansion of Fish Creek Reservoir. The absorption of Fish Creek Reservoir visitors by facilities in the secondary study area would result in increased pressure on the recreational resources at these facilities, and could potentially cause a decrease in the quality of some recreational experiences. Because many of the developed resources in the secondary study area are already overused (Schmitzer R., 1992), the addition of visitors from Fish Creek Reservoir could potentially augment existing problems. Summit Lake and Long Lake, which contain similar resources and are in close proximity to Fish Creek Reservoir, should absorb the majority of displaced visitors unable to recreate in the primary study area. Good signage and public awareness could aid in dispersing visitors.

Other short term impacts associated with Alternative B include disturbances to the area by construction-related activities. The visual quality of the primary study area would be affected by the draining of the reservoir and by the presence of construction vehicles, a construction camp and borrow pits (See Section 4.11, Visual Resources). Consequently, the quality of the recreation experience for mountain bikers, hikers and sightseers travelling past the reservoir along FDR 310 would be affected. In the secondary study area, the presence of construction vehicles going to and from the reservoir along FDR 60 and 310 would also affect recreation experiences.

Long Term Impacts - Over the long-term, Alternative B would affect future recreation patterns in the primary study area. Since the proposed expansion includes, as part of project mitigation, plans to replace the existing campground with an upgraded and slightly larger campground, recreational use of Fish Creek Reservoir should increase. Plans for the new campground include eight campsites (with space for eight future sites), additional parking, and an improved boat ramp (See Section 4.9.5, Mitigation and Enhancements Summary). The new site would also be accessible to the physically disabled. These modifications would increase the capacity of the campground and would likely affect the user population. By increasing the capacity and accessibility of Granite Campground, pressure on over-crowded facilities in the secondary study area would be reduced by better dispersing visitors throughout the Buffalo Pass area. However, a shift to increased usage on Fish Creek Reservoir would likely result in minor impacts to the water quality of the reservoir and to the relatively pristine nature of the area, both of which are valuable characteristics of the reservoir.

4.9.2.3 Alternative C - Smaller Reservoir Expansion

If Alternative C is chosen, recreational facilities discussed above would still be inundated and would need to be replaced. Subsequently, the impacts to recreational resources associated with Alternative C, Smaller Reservoir Expansion would be identical to those associated with Alternative B, Proposed Reservoir Expansion.

4.9.3 Connected Actions

Future increases in recreational use of Fish Creek Reservoir would be connected to actions other than the expansion of the reservoir. Increases in visitor use of Fish Creek Reservoir would be

expected as a result of summer marketing measures. The present marketing strategies of the City of Steamboat Springs and the Chamber Resort Association, which aim to increase summer tourism in Steamboat Springs, could create additional demand for developed and dispersed recreation in the Routt National Forest. In order to accommodate this future demand and relieve pressures on existing facilities in the Buffalo Pass area, the Forest Service is developing the Buffalo Pass Capital Investment Project. The project is a means of further dispersing visitors throughout the area and reducing the environmental impacts, associated with the heavy use of the Buffalo Pass area. The project plans to expand the supply of developed facilities in the Buffalo Pass area and includes a proposal to enlarge Granite Campground in conjunction with the Fish Creek Reservoir expansion. The project will also improve access to the area by upgrading Buffalo Pass Road. While the Buffalo Pass Capital Improvement Project is intended to accommodate the increased use trend in the Buffalo Pass area by dispersing recreationists, it could result in increased recreational use of the Fish Creek Reservoir area. Thus, although future increases in recreational use of Fish Creek Reservoir would result from the mitigation proposed for the reservoir expansion, these increases could occur to some extent without the project due to marketing measures which increase tourism, and to the Buffalo Pass Capital Investment Project, which is intended to disperse visitors within the heavily used Buffalo Pass area.

4.9.4 Cumulative Impacts

Use levels in the Buffalo Pass area should steadily increase because accessible recreation opportunities are in demand and are being targeted by summer marketing measures in Steamboat Springs (See Section 3.4, Socioeconomics). Consequently, if Alternative B, Proposed Reservoir Expansion, or Alternative C, Smaller Reservoir Expansion, is chosen, their short term impacts to the secondary study area and long term impacts to the primary study area could be increased by additional tourism to the area.

4.9.5 Mitigation and Enhancements Summary

Due to the inundation of Granite Campground, under Alternatives B or C, the Applicant would rebuild the campground above the expanded shoreline. Proposed mitigation for Alternatives B and C is the same and involves the construction of a new campground at one of two possible relocation sites. New facilities would include a two-way gravel entrance road, four vehicle access camping sites, four walk-in tent sites, one composting toilet, a concrete boat ramp (with a length to accommodate water level decrease of the reservoir during the heavy use recreation season), two picnic sites, 10-12 vehicle gravel parking, and information boards. Both of the roads and the parking facility would be gravel to reduce possible run-off of petroleum products into the reservoir. The shoreline trail which currently circles the reservoir would not be rebuilt (the Forest Service has decided to let the trail be formed by the users again).

4.9.6 Unavoidable Adverse Impacts

If Alternative B or Alternative C is chosen, the unique character of Fish Creek Reservoir would be altered permanently. As described briefly in this section and in more detail in Section 3.9, Recreation, Fish Creek Reservoir is a fairly remote recreation area with a limited amount of developed facilities, and thus provides a rather tranquil and pristine recreation setting. An enlargement of the reservoir and the subsequent expansion of the developed facilities at the reservoir would attract more visitors to the area and would, as a result, alter the pristine character of the recreation setting. As noted above, this could happen to some extent anyway due to Forest Service

actions and summer marketing. The upgraded recreation facilities, however, could lend to the enjoyment of the area.

4.10 TRANSPORTATION

4.10.1 Introduction

There are two transportation routes to Fish Creek Reservoir. As identified and discussed in Section 3.10, the West Route provides access to the reservoir from the City of Steamboat Springs along FDR 60 and FDR 310, while the East Route provides access from North Park in Jackson County. Because all mobilization of construction related equipment would occur on the West Route, there would be no foreseeable impacts to the East Route. Potential impacts to the West Route which could occur as a result of the Proposed Action and project alternatives are discussed below.

4.10.2 Direct and Indirect Impacts

4.10.2.1 Alternative A - No Action

Under Alternative A, the existing service roads accessing the main and saddle dams would remain.

4.10.2.2 Alternative B - Proposed Reservoir Expansion

The impacts associated with Alternative B would be primarily direct, short term impacts. Assuming that appropriate mitigation is performed, the west transportation corridor to Fish Creek Reservoir would be affected during the construction period only. Thus, impacts to transportation routes would be temporary and would coincide with the proposed construction activities of the project.

Safety Concerns - Mobilization of construction related equipment to and from the project site would occur once in July and once in October in year one and year two of construction respectively. As previously mentioned, mobilization would be along the West Route. Approximately 15-30 vehicles per day (carrying heavy equipment), would be using the West Route during the mobilization phases of the project. The ADT on the west side of FDR 60 would increase from 83 to approximately 113 during the weekdays, with peak weekdays reaching as high as 143. During the weekends, the ADT would likely exceed 200.

Because of these increases in traffic, the probability of an accident occurring along the West Route (during mobilization) would increase. Most of the increased traffic during mobilization would be heavy equipment. Because FDR 60 and FDR 310 are commonly used by mountain bikers, the safety of recreational bikers would be a concern, as the probability of an automobile/bicycle accident would also increase during mobilization.

Construction activities would occur between July and October during both years of construction. During construction, approximately 7-15 supply vehicles per day carrying such things as fuel, concrete, and workers would also be using the West Route and would thus increase the traffic and the probability of an accident along this transportation corridor. During the construction period, the ADT along the west side of FDR 60 would increase from 83 to approximately 97 during the week, with peak weekdays reaching 113. On the weekends, the ADT would increase to approximately 187. Due to these increases in traffic and due to the width of the roads (approximately 15 to 20 feet wide), the probability of a traffic accident occurring along the West Route during the construction period of the proposed project would increase. Again, the safety of

recreational bikers using FDR 60 and FDR 310 would also be affected during the construction period.

As discussed in Section 3.10, access to the West Route (FDR 60) would be through the City of Steamboat Springs. Because of this, increases in traffic and in the probability of an accident would also occur along the designated city access routes identified in Section 3.10.

A final safety impact associated with the proposed project would be an increased chance of a hazardous spill occurring along the West Route. During the construction phase, fuel trucks would be travelling along the West Route. Approximately 2.7 miles of roads along the West Route are in close proximity to creeks or streams (as defined in Section 3.10). At locations where the West Route is in close proximity to water resources, there would be a high probability that a spill could reach a creek or stream before cleanup could be completed.

Road Conditions - Along the West Route, from Dry Lake Campground to Fish Creek Reservoir, there are several sections of roads which have little or no base material. These areas, when wet, can be soft and easily damaged. If a decision to expand Fish Creek Reservoir is made, the City would remove snow from the West Route in the spring and would then transport the equipment required for the proposed expansion to Fish Creek Reservoir. During the mobilization of this heavy equipment, the road surface would likely be wet, and in soft areas where there is little or no base material, damage to the road would likely occur. In addition, according to Section 3.10, there are several culverts along the West Route which have less than one foot of cover. During the mobilization periods, there would be a high probability that these culverts would be damaged.

During the construction period of the Proposed Action supply vehicles would be using the West Route daily. By this time, the roads should dry out and should be more conducive to handling an increased load. Furthermore, the weight and size of the supply vehicles would be less than that of the heavy equipment being moved initially. Thus, impacts which would occur to the roads during the construction phase could be of a lesser degree than those impacts which would occur during the mobilization of heavy equipment. However, because of rainfall, the roads would still be wet at times and would continue to be susceptible to damage from the transport of equipment and supplies. In addition, culverts with less than one foot of cover would also be prone to damage.

Routt County and the Applicant have developed a memorandum of understanding (MOU) pertaining to site access via County roads. According to the MOU, the Applicant is responsible for the mitigation of all impacts to county roads associated with construction activities.

New Road Construction - Under Alternative B, a portion of FDR 310.2 would be inundated. To replace this portion of the road, the City has proposed three road corridor options as shown in Figure 2-5. The preferred road alternative would be constructed using conventional equipment and would be covered with gravel. There would be disturbances to wetlands, however, associated with all three of the road alternatives. These disturbances would be as follows:

- Road Corridor Option 1 would be constructed through the trees approximately 100 feet from an open meadow. It would disturb approximately 0.69 acres of land, 0.04 acres of which would be wetlands.

- Road Corridor Option 2 would be constructed through the middle of an open meadow. It would disturb approximately 0.89 acres of land, 0.37 acres of which would be wetlands.

- Road Corridor Option 3 would be constructed along the expanded shoreline adjacent to an open meadow. It would disturb approximately 0.80 acres of land, 0.48 acres of which would be wetlands.

A detailed discussion of impacts to wetlands is presented in Section 4.5, Wetlands.

4.10.2.3 Alternative C - Smaller Reservoir Expansion

The impacts associated with Alternative C would be generally the same as those associated with Alternative B. It is possible that less equipment, and thus less vehicles, would be required for a smaller reservoir expansion. It is assumed, however, that the majority of the increases in traffic associated with Alternative B would also occur under Alternative C. Thus, the impacts to the condition of the West Route and the increases in the probability of an accident that are associated with Alternative B, would also occur if Alternative C is implemented. Furthermore, a smaller reservoir expansion would still inundate a portion of FDR 310.2. Road alternatives to replace this portion of FDR 310.2 would be identical to those mentioned above.

4.10.3 Cumulative Impacts

Cumulative impacts to FDR 60 and FDR 310 could occur as a result of the incremental effects of:

- Normal traffic levels
- Increases in traffic due to increases in tourism
- The addition of heavy equipment and supply vehicles using the roads during the mobilization and construction periods of the proposed reservoir expansion

It is anticipated, however, that the majority of transportation-related impacts associated with an expansion of Fish Creek Reservoir would occur as a direct result of the project itself. To a small degree, the aforementioned impacts to FDR 60 and FDR 310 could be augmented by the cumulative effects of tourist traffic combined with construction-related traffic, but potential increases due to tourist traffic should be negligible.

4.10.4 Mitigation and Enhancements Summary

Due to the impacts to transportation safety and to road conditions that would occur as a result of Alternatives B or C, various mitigation measures have been suggested. In order to minimize the probability of an accident due to increased traffic, mobilization of heavy equipment, and transportation of supply vehicles, the following measures should be implemented:

- During mobilization of heavy equipment to the site, the West Route from Dry Lake Campground to Fish Creek Reservoir should be closed to public traffic
- Supply trucks should only be allowed to travel the West Route on weekdays during daylight hours
- The City should post signs indicating that supply trucks may be encountered along the West Route on weekdays during daylight hours

- During mobilization of heavy equipment through town, pilot cars should be used for over-width vehicles

- A schedule should be developed to minimize supply truck travel through town during peak morning hours and late afternoon hours when people are travelling to and from work or school

- Supply trucks and heavy equipment should use City Route 1 (as defined in Section 3.10) because this route travels through less dense neighborhoods and traffic loads are normally lighter

- Car pooling among those working at Fish Creek Reservoir should be encouraged if a construction camp is not utilized

- An approved emergency hazardous waste spill response plan (describing procedures to be implemented in case of a fuel or hazardous waste spill) should be submitted to the Forest Service before any fuel or other hazardous material is transported over the West Route

- Dust abatement would be required

In addition, to minimize the impacts to the road conditions along the West Route, the Applicant should submit and implement a road maintenance plan which ensures that the surface of the roads remain in the same condition as described in the Road Condition Survey (RCS) conducted in October 1992 (ACZ, 1992e). This could include the replacement of damaged culverts and/or drainage ditches, as well as the addition of suitable base material in areas significantly damaged by heavy equipment. Road repair and maintenance would be approved and inspected by the Forest Service.

As discussed previously, the Applicant and the County have prepared a MOU in which the Applicant agrees to mitigate any construction-related damages to County roads. This MOU is included in Appendix K, Project Mitigation.

Finally, it is suggested that Road Corridor Option 1 (as identified above) be used to replace the inundated portion of FDR 310.2. Road Corridor Option 1 would disturb the least amount of land and the least amount of wetlands, and would be less visible from the reservoir area than the other two alternatives. Precautions should also be taken so that any material imported for the road surfacing does not contain noxious weeds. Additionally, all road sections that will no longer be required after construction is completed should be properly reclaimed according to Forest Service criteria.

4.10.5 Unavoidable Adverse Impacts

If Fish Creek Reservoir is expanded, under either Alternative B or Alternative C, there would be no long-term unavoidable adverse impacts to either the West Route or the East Route.

4.11 VISUAL RESOURCES

4.11.1 Introduction

The visual impact analysis is based on the premise that visitors to the National Forest prefer to see the forest in a condition as close as possible to its natural state, and thus facility development, such as the Proposed Action should be as compatible as possible to the natural form, line, color, and texture, consistent with other resource requirements of the forest. In the case of Fish Creek Reservoir, municipal water supply is considered an important resource use of the area and thus a certain degree of visual change is considered acceptable by the Forest Service to allow development of the water supply resource.

The Forest Service, therefore, has assigned a "modification" visual quality objective (VQO) for the Fish Creek Reservoir and adjacent lands (Management Area 10E), except for the FDR 310 corridor (Management Area 2B), which has been assigned a "partial retention" visual quality objective (see Figure 1-2). Compatibility with visual quality objectives is determined based on the following considerations:

- Will the project be highly visible?
- Will the project be consistent with the existing scenic quality?
- Will the project be designed to blend into the setting so changes are not highly noticeable?

Significant impacts would be actions that do not meet the Forest Service's visual quality objectives by creating an unacceptable level of contrast with the adjacent natural landscape as seen from sensitive areas, regardless of mitigation and reclamation measures. In some cases, proposed actions will create beneficial visual quality impacts, which are also noted.

4.11.2 Direct and Indirect Impacts

4.11.2.1 Alternative A - No Action

Under Alternative A, the existing visual problems at the reservoir would remain the same. These include the former borrow areas that have not been adequately reclaimed, the existing maintenance shed, and the access road on the north terminus of the dam. These areas currently do not meet the "modification" VQO, as discussed in Section 3.11.

In addition, low in-stream flows in the portion of Fish Creek downstream of the water filtration plant would continue to impair the creek's visual quality. During the fall season, flows in this portion of the creek can be reduced to almost zero flow. Extremely low flows reduce the visual interest of the creek, as pools and riffles dry up, whitewater disappears, and the river bottom becomes exposed. The low flows generally occur between late July and early November. Steamboat Springs has been experiencing a gradually increasing number of visitors during this period, due to the City's summer marketing effort (see Section 3.4). Since Fish Creek flows through the Sheraton Golf Course, the Anglers Drive residential neighborhood, and the Fish Creek Trailer Park and crosses the recently completed Yampa River Trail, it is of relatively high sensitivity.

An indirect impact of Alternative A would be the effects of water shortages that could occur without the expanded reservoir capacity. Water shortages could result in watering restrictions, which would adversely affect the residential and commercial landscapes and ornamental plantings in Steamboat Springs. The City depends on landscaping to mitigate the adverse visual effects of various types of development. It is also possible, however, that within the next 20 years more drought resistant plants can be gradually phased into the City's planting standards.

4.11.2.2 Alternative B - Proposed Reservoir Expansion

Short Term Direct Impacts - Construction activities associated with Alternative B would result in short-term visual impacts for two consecutive recreation seasons. Since access to the area is quite limited during the winter, the two construction periods (late May through October) would coincide with the primary recreational use of the area. There would be some visual impacts to hunters or other recreationists that do visit the site in the late fall, resulting from the drained reservoir and any trailers or material stockpiles left by the contractor. During the summer months, construction activities would be readily apparent to those passing by the reservoir on FDR 310 (see Section 3.9 for existing recreation uses). Since the campground would be closed during construction, there will be no short-term visual impacts to people using the campground.

Short-term visual impacts during construction would result from the activities and features listed below. It is unlikely that any of these activities would meet the "modification" VQO during the construction period. The exact impacts of each activity would depend on the final location and design of each feature.

- Structures required for the construction camp
- Materials stockpiles
- The concrete batch plant
- Staging areas
- Clearing activities for the expanded reservoir
- Clearing for other facilities (dams, campground, construction camp, spillway)
- Draining of the reservoir
- Earth moving and other types of construction equipment
- Excavation of borrow material
- Fugitive dust created by the above and other construction activities

In addition, the traffic generated by the project would create a visual change, as well as increased noise and dust levels, to those using or living along the proposed access route (Fish Creek Reservoir Road ,Buffalo Pass Road, and Strawberry Park Road). If construction proceeds, project-related traffic would be an estimated average of 15 vehicles per day round trip during mobilization and demobilization at the beginning and end of the construction seasons. Peak traffic during this time is estimated to be 30 vehicles per day round trip. Average daily traffic during the remaining period would be an estimated 7 vehicles round trip, with a peak of 15 vehicles. It is not expected that night lighting would be required during the project construction. If the contractor should fall behind schedule, night shifts and thus night lighting could be required, which could create a very short-term, adverse visual effect, depending on the type and intensity of lighting.

Long Term Direct Impacts - Long term direct impacts of Alternative B would be limited to the area in the immediate vicinity of the reservoir, including both the existing and proposed campgrounds, the proposed trailhead to Long Lake, and the portion of the Middle Fork of Fish Creek immediately downstream of the dam (approximately 1/2 mile in length). Approximately 1.3

miles of FDR 310 would have visibility to the project. The project would not be visible from Buffalo Pass, Fish Creek Falls, the Fish Creek Falls Trail, or Mount Werner.

Discussed below are the impacts on visual quality as seen from the six key viewpoints described in Section 3.11. The six viewpoints are all places that are frequented by a relatively large number of visitors and thus have a high level of sensitivity. Visual impacts visible from locations other than the key viewpoints are also discussed under "Other Direct Impacts."

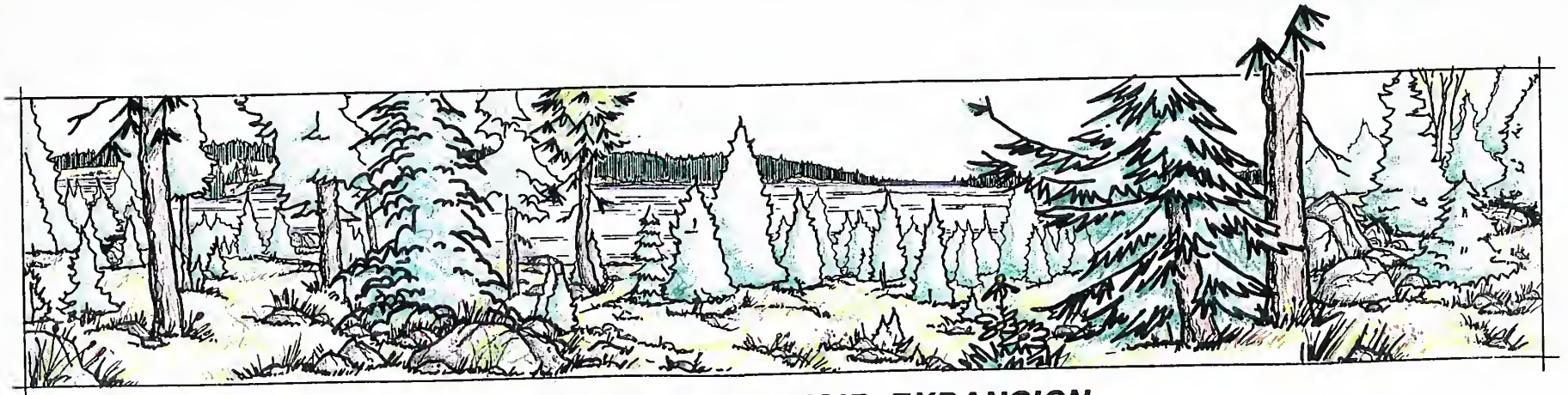
Viewpoint A Impacts - Viewpoint A is located at the existing campground looking towards the dam. Since the expanded reservoir would inundate the campground, this exact view would not exist any longer when the reservoir is full. Figure 4-1 estimates how this view would appear from the surface of the reservoir at that point. The foreground trees and vegetation would all be inundated, as would the small islands, and the view of water would be greatly expanded. This larger expanse of water would be the most dominant visual change, contrasting significantly from the existing view. Such large bodies of water are not generally found within this portion of the forest, but since the reservoir's visual elements borrow from natural color, form, line and texture, it would meet the "modification" objective when the reservoir is full. Since water is generally considered a visually desirable element in the landscape, the increase in size of the reservoir by approximately 50 acres would be considered a beneficial visual impact.

Another beneficial impact would be the smaller drawdowns resulting from the project. The proposed outlet structure and remote operational control works would allow the City to release only the water it needs to meet demand, which is currently about 350 AF, or 19 percent of the existing storage capacity. The City currently releases between 1,000 and 1,200 AF, or approximately 65 percent of existing capacity. As water demand increases over time, drawdowns would increase, but this would happen with or without the project.

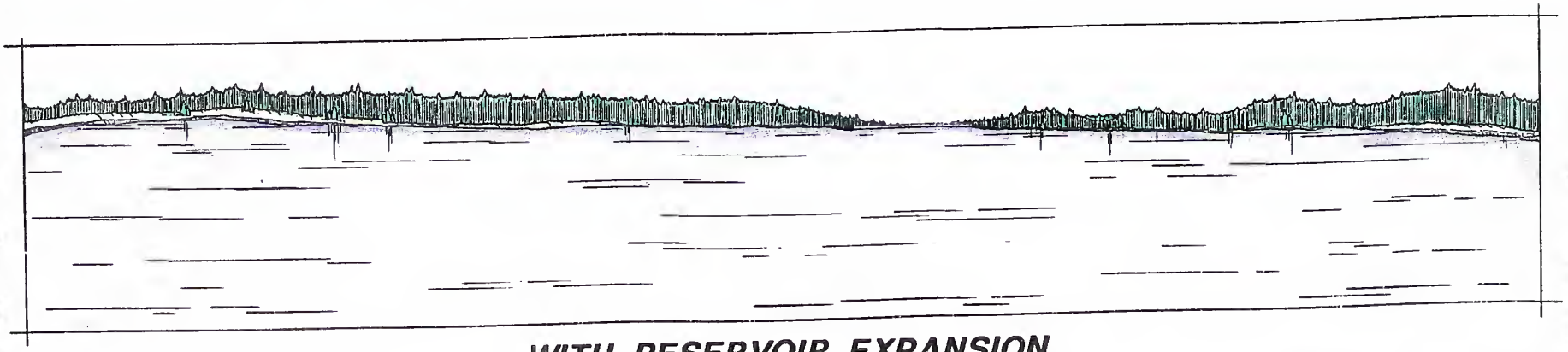
Although the project would reduce drawdowns over existing conditions, the drawdowns would expose additional shoreline and would not meet the "modification" VQO because of the contrast created in color and texture and its foreground location. During normal operations, the reservoir would be drawn down from August until spring runoff fills the reservoir, usually in late April or May. Most of the drawdown impacts would occur during August, since recreational use is significantly lower after Labor Day than during the summer months.

Under Alternative B, the dam would increase in length from 650 feet to 830 feet. The dam is located in the middleground from Viewpoint A (2/3 mile away) and thus the increased length would be readily apparent. Although the horizontal line of the dam is compatible with natural conditions, the form of the dam is much straighter than naturally established form, which would be accentuated by the longer dam. When the reservoir is full, the increased height of the dam would not be visible, since the freeboard would be the same as under existing operations. Since the dam borrows from naturally established line, color, and texture and is visually compatible with the surroundings from this viewpoint, it would meet the "modification" VQO. When seen as foreground, however, the dam would not meet the "modification" VQO because its contrasting form would dominate the view.

The proposed control building would also be subordinate to the overall composition of the view because of its relatively small size (10′ h x 20′ w x 15′ d) and its distance from this viewpoint. The presence of background trees behind the structure would also help it blend in with the surroundings.



WITHOUT RESERVOIR EXPANSION



WITH RESERVOIR EXPANSION

Project No.: 828-1500	Design By:	Scale: NO SCALE
File: FC4VA.DWG	Drawn By: K. Olsen	Date: August 1993

FIGURE 4-1

FISH CREEK RESERVOIR EIS

VIEWPOINT A - VIEW FROM EXISTING CAMPGROUND

As one approaches the dam along the shoreline trail or from the reservoir, however, the structure would become more apparent. Although its wood siding would be compatible with natural texture, the geometric form and vertical nature would contrast with the natural, rounded forms and the horizontal lines of the dam, treeline, and waterline. The structure would thus meet the "modification" VQO as viewed from Viewpoint A, because the scale is such that it would remain subordinate to the composition, but from closer points it would not meet this objective.

Viewpoint B Impacts - Viewpoint B is located at Campground Relocation Site 1 looking towards the water. Figure 4-2 indicates how this view would appear before and after completion of Alternative B. The primary change would be the larger expanse of water. Some of the foreground trees would be inundated, reducing some of the screening potential. As with viewpoint A, the expanded view of water would meet the "modification" objective when the reservoir is full, but with the reservoir drawn down, the "modification" objective would not be met.

It may also be possible to see the proposed borrow areas from this viewpoint. There could be a narrow band of borrow area, approximately 30 to 50 feet wide and 1.1 miles long, extending along the proposed reservoir shoreline that would not be inundated. Although the borrow areas would be reseeded with native grasses, they would not have the same mixture of rocks and vegetation of adjacent areas and thus would contrast with the natural texture. Borrow areas on the opposite shore would be in the middleground (approximately 1/4 mile away) and thus the disturbance may be difficult to detect, but the absence of trees from the area would be noticeable. Borrow areas on the north shore would also be visible from the campground, which would be in the foreground and thus more apparent. Any trees removed from borrow areas would further reduce screening.

Alternative B would inundate the existing access road visible from this viewpoint. If Road Corridor Option 3 is selected, however, the new access road may be visible. If visible, the road would not meet the "modification" visual quality objective, due to the contrasting color, texture, and line.

Viewpoint C Impacts - Viewpoint C is located on the Fish Creek Reservoir Road (FDR 310) near its intersection with the reservoir access road. Alterations within the FDR 310 corridor would need to meet the "partial retention" VQO, but the views of features located outside the corridor, such as the dam, would need to meet the "modification" VQO. Impacts from this viewpoint would be very similar to those of viewpoint A. The foreground vegetation and stream would be inundated, replaced by a large expanse of water (Figure 4-3). When drawn down, the reservoir would have similar impacts as viewpoint A. The new dam and control structure would also impact the view as discussed under viewpoint A. Borrow areas would most likely be visible in the foreground of this view, as discussed for Viewpoint B. There are no trees in the foreground, but there are existing shrubs that would be removed and replaced with grasses once the borrow area is reclaimed. Except during drawdowns, the project features from this viewpoint would meet the "partial retention" and "modification" VQO, assuming borrow areas are adequately reclaimed.

Viewpoint D Impacts - This viewpoint is located on FDR 310 near the Long Lake Trailhead, looking towards the reservoir. As with Viewpoint C, alterations within the FDR 310 corridor would need to meet the "partial retention" VQO. The primary impact from this viewpoint would be the proposed Road Corridor Option 2 route for the access road, located in the middleground (Figure 4-4). Within the east half (right side) of the view, there is no vegetation to provide screening.

The road would cross the existing meadow, contrasting with its form, line, and texture, and thus would not meet the "partial retention" VQO. It is possible that the Road Corridor Option 3 access route would be visible from this viewpoint, but it would be farther away than Road Corridor Option 3, and thus not as visually apparent.

Viewpoint E Impacts - This viewpoint is located at the existing campground access road looking towards Campground Relocation Site 1. Section 4-9 describes the facilities to be constructed. As with viewpoint A, this viewpoint would be submerged by the reservoir expansion, but provides an idea of what the campground would look like from the reservoir (Figure 4-5). The middleground trees would provide screening, although some trees would most likely be removed to construct the campground or to utilize the borrow area. A narrow strip of borrow area, approximately 20-30 feet wide, would be visible along the shoreline in front of the campground.

The campground would need to meet the "partial retention" visual quality objective, because it is close to the FDR 310 corridor. The campground itself would meet this objective, because it would remain visually subordinate to the surrounding landscape and would repeat natural form, line, color, and texture. This assumes that the campground composting toilet is designed in such a way to fit in with its surroundings. When the campground is fully occupied with tents and vehicles, however, it would be much more apparent as an introduced facility. The 10-12 car parking lot, the campground access road, and the boat ramp would also be readily apparent, as they would create contrast in terms of color and texture. The expanded campground and the facilities for vehicles would result in a less remote atmosphere at the reservoir by attracting more visitors and vehicles to the site. If the eight future campsites are developed, the uncrowded quality would be further reduced.

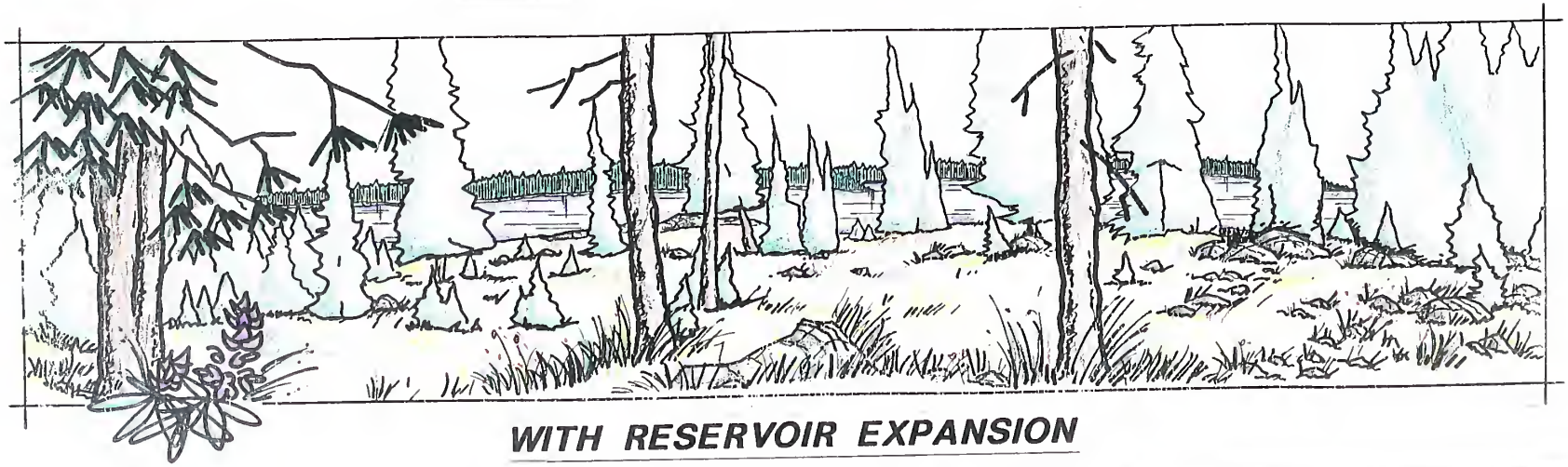
Viewpoint F Impacts - Viewpoint F is located on the north shore of the reservoir looking towards the proposed saddle dam (Figure 4-6). This viewpoint would also be submerged by the expanded reservoir. Figure 4-6 shows approximately how it would appear from the water surface after construction. The dam's height above normal water surface level would be the same as under existing conditions. The length of the saddle dam would increase from 400 to 1060 feet. The cut slope on the spillway's east side would most likely be the only aspect of the spillway visible from Viewpoint F. From the middleground view, the slope would be obviously man-made, but the existing rock outcroppings above the spillway would help blend the slope in with the background. The City plans to relocate the existing maintenance shed, since it is situated under the proposed dam.

Other Direct Impacts - The project would have a number of other direct visual impacts, in addition to the viewpoint impacts discussed above. One such impact would be the power cubicles located every 1,250 feet along the proposed underground powerline (Figure 2-5). The boxes would be visible along FDR 310 from its intersection with the Hayden-Cheyenne powerline to a point approximately one-half mile north of the reservoir access road. The boxes would not meet the "partial retention" objective established for the FDR 310 corridor, due to their contrast with natural form, line, and texture. A power cubicle would also be visible along each of the dams and from the reservoir shoreline, which would meet the "modification" VQO for the reservoir, since their small size would allow them to remain visually subordinate. Since most of the powerline itself would be installed within existing roadways, vegetation disturbance would be limited to the 2,300-foot portion not located within existing roadways, of which approximately one-half would be visible from the shoreline.

The views from Puppy Dog Lake and the Middle Fork of Fish Creek, looking upstream towards the saddle and main dams, respectively, would be altered as the dams increase in length and height.



WITHOUT RESERVOIR EXPANSION



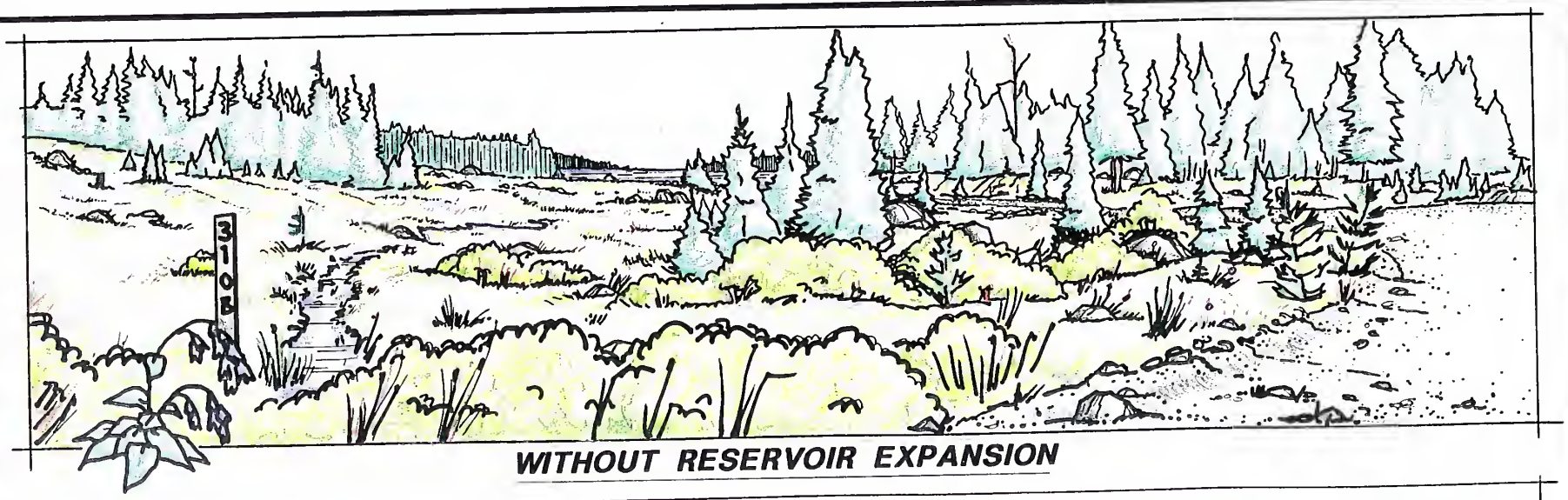
WITH RESERVOIR EXPANSION

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File: FC4VB.DWG	Drawn By: K. OLSEN	Date: August 1993

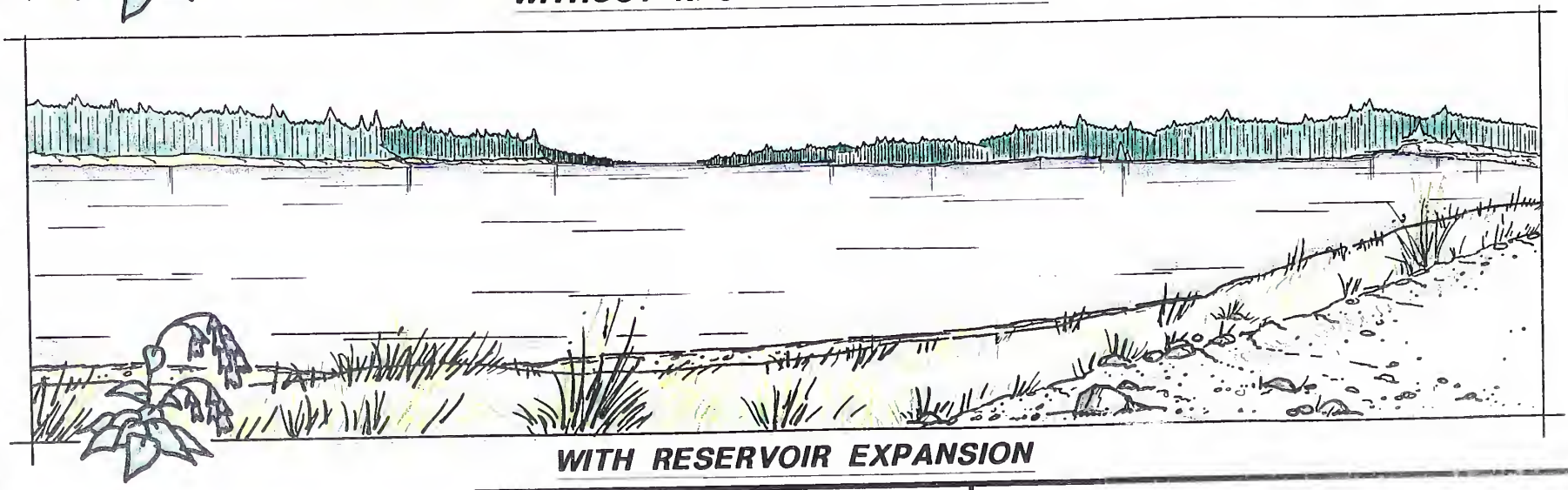
FIGURE 4-2

FISH CREEK RESERVOIR EIS

VIEWPOINT B - VIEW FROM PROPOSED CAMPGROUND



WITHOUT RESERVOIR EXPANSION



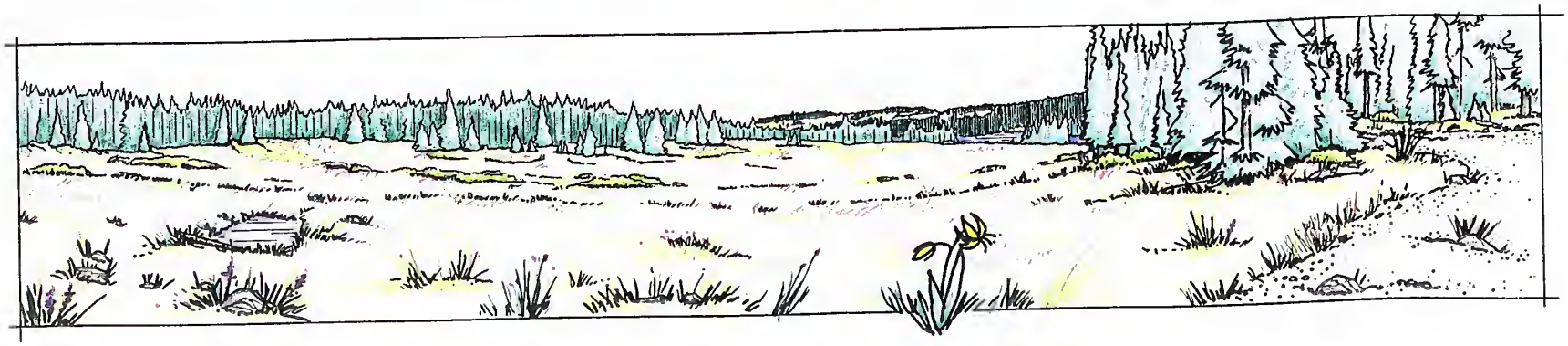
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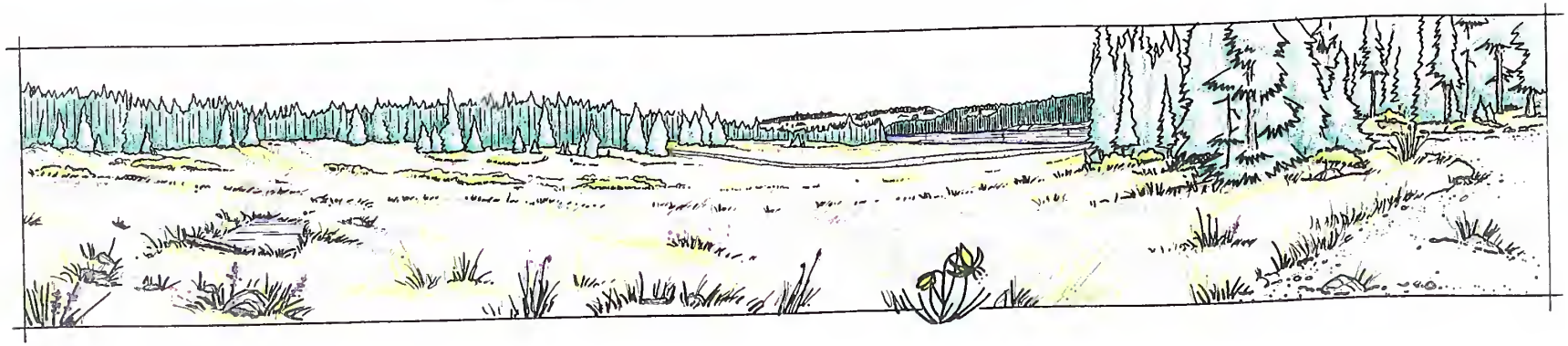
FIGURE 4-3

FISH CREEK RESERVOIR EIS

VIEWPOINT C - VIEW FROM FDR 310



WITHOUT RESERVOIR EXPANSION



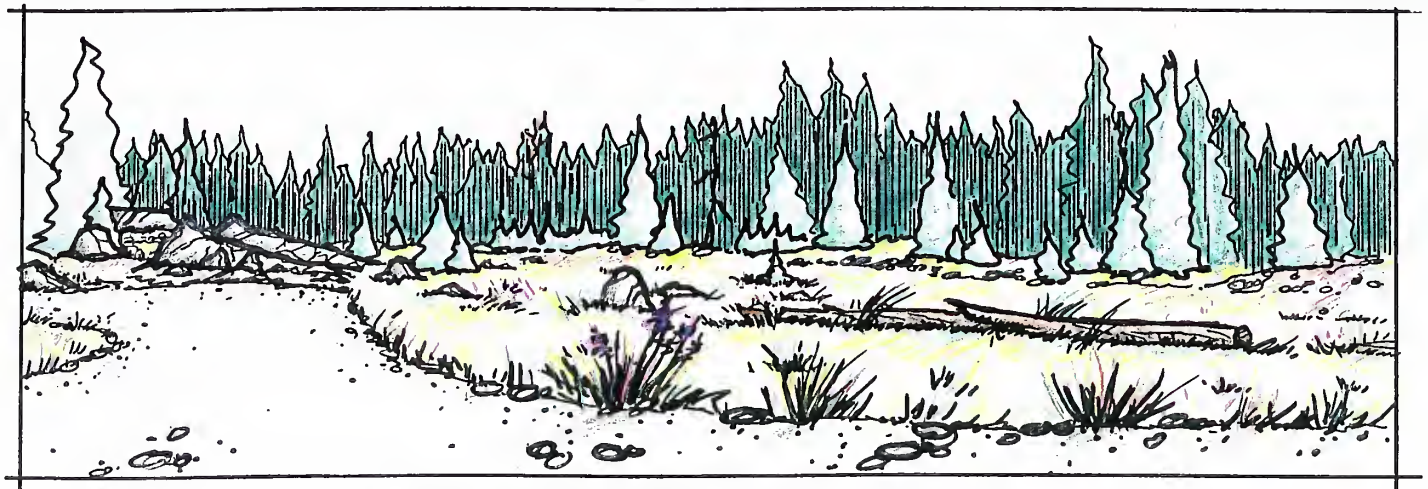
WITH RESERVOIR EXPANSION

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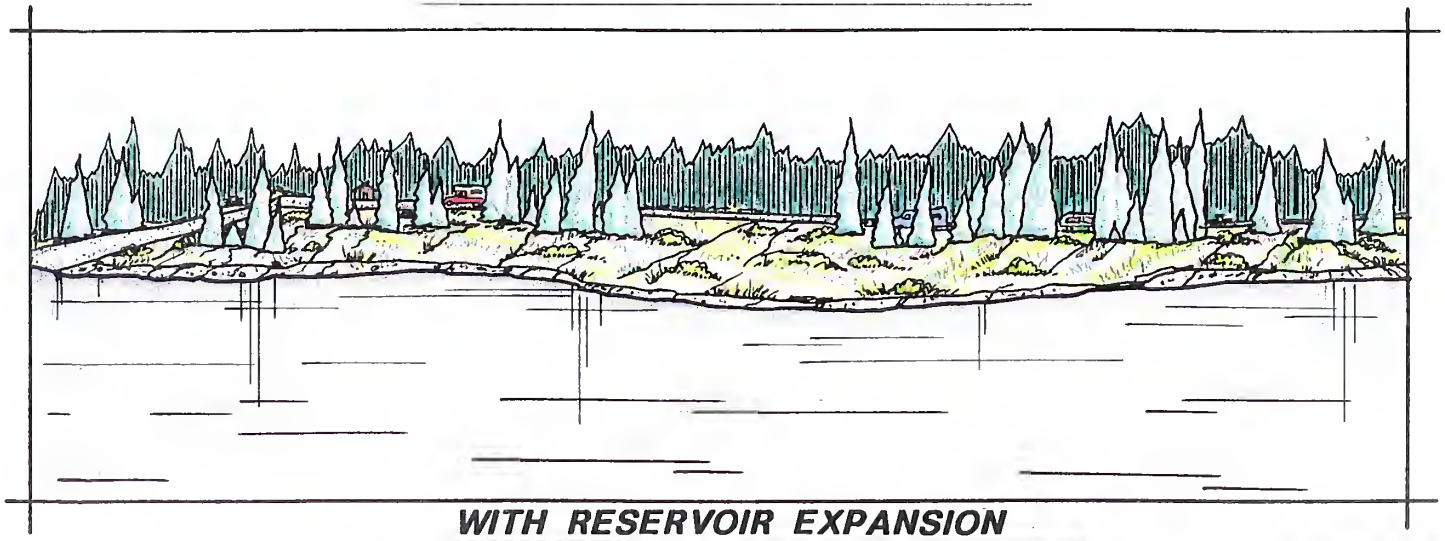
FIGURE 4-4

FISH CREEK RESERVOIR EIS

VIEWPOINT D - VIEW FROM LONG LAKE TRAILHEAD



WITHOUT RESERVOIR EXPANSION



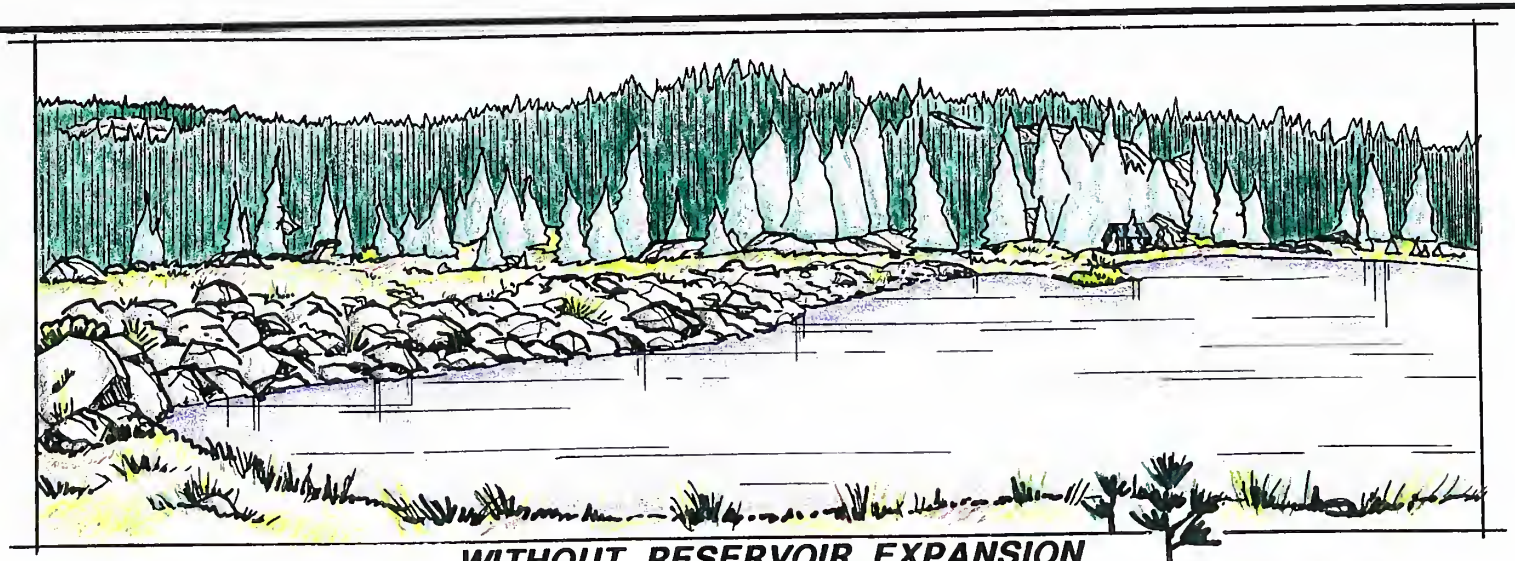
WITH RESERVOIR EXPANSION

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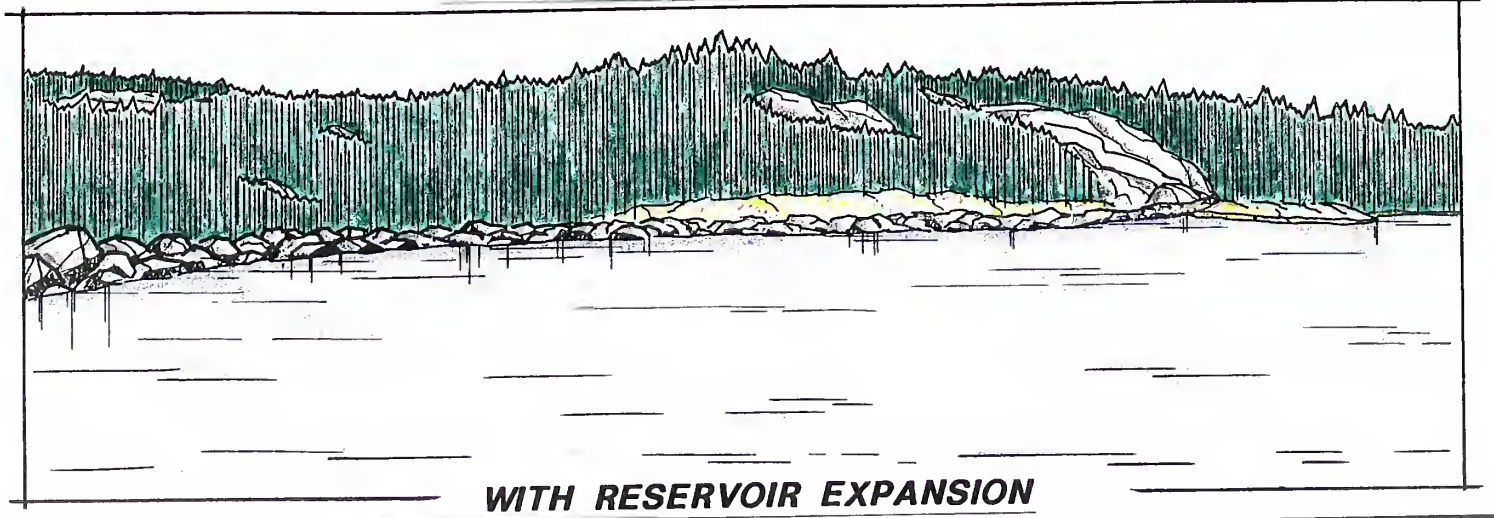
FIGURE 4-5

FISH CREEK RESERVOIR EIS

VIEWPOINT E - VIEW TOWARD PROPOSED CAMPGROUND



WITHOUT RESERVOIR EXPANSION



WITH RESERVOIR EXPANSION

Project No.: 828-1500	Design By:	Scale: NO SCALE
File: FC4VF.DWG	Drawn By: K. OLSEN	Date: August 1993

FIGURE 4-6

FISH CREEK RESERVOIR EIS

VIEWPOINT F - VIEW TOWARD SADDLE DAM

The main dam would be riprapped and the saddle dam would be either seeded or riprapped. The spillway would also be visible from Puppy Dog Lake, which would have either a riprapped or bedrock channel along the top half and a grass lined channel below. The side slopes would be grass or bedrock. Although the view of the spillway and dams from downstream would not meet "modification" VQO, the small number of visitors make this an area of low sensitivity.

A beneficial impact would be the old borrow areas to be reclaimed as part of the project. Another beneficial impact would be the stream channel rehabilitation proposed downstream of Puppy Dog Lake. Although not seen by many visitors, the existing erosion resulting from current reservoir operation represents a visual disturbance that needs to be repaired. The new outlet control works and spillway would prevent future erosion by reducing flows through Puppy Dog Lake.

Impacts of Road Corridor Option 2 were discussed under Viewpoint D. Road Corridor Options 1 and 3 would also have visual impacts. Approximately 1/3 mile of Option 1 is routed along the existing trail to Long Lake. The clearing and grading required to convert the trail into a road would represent a visual change seen by the many recreationists that use the trail to access Long Lake and the Fish Creek Falls Trail. The disturbance, however, would be screened from view from other areas by trees and thus would have less visual impact than the other road corridor options. Option 3 would be visible from FDR 310 and probably from the north shore of the reservoir and Campground Relocation Site 1 as discussed under Viewpoint B. The proposed access road, regardless of its location, would not meet the "modification" VQO, since it would contrast in terms of line, color, and texture with its surroundings. All three road corridor options include rerouting 600 feet of the existing access road immediately east of the dam above the proposed water line and rerouting 1,000 feet of the existing road out of a clearing. Both of the rerouted segments would be screened from the surroundings by existing trees.

The Applicant may be required to create off-site wetlands to mitigate impacts. Since the exact locations of such efforts have not been finalized, their visual impacts cannot be determined. Any structures required for mitigation would thus need to be approved by the Forest Service prior to installation. Structures should be as compatible as possible with the form, line, color and texture found in the vicinity.

Indirect Impacts - As discussed under Alternative A (Section 4.11.2.1), low flows in Fish Creek downstream of the municipal filtration plant represent an existing visual concern. Fish Creek is an important natural feature within a tourist-oriented community, and thus the creek's aesthetic value is of concern to the City. The low flows can occur as early as July and often occur in August, both prime months for tourism. The remote operational control proposed as part of the project would give the City more flexibility in operating the reservoir and thus allow them to maintain the minimum flow of 2 cfs in the creek required by stipulation with the Colorado Water Conservation Board.

4.11.2.3 Alternative C - Smaller Reservoir Expansion

Short-Term Direct Impacts - The short-term impacts of Alternative C would be similar to those of Alternative B, primarily because the construction period would be the same for both alternatives. The magnitude of visual impacts from Alternative C, however, may be less in some respects than that for Alternative B due to the smaller scope of the project, but the lack of detailed construction plans makes it difficult to quantify. Material stockpiles, for example, may be smaller, as would borrow areas. Clearing should also be less extensive.

Long Term Direct Impacts - The long term impacts of Alternative C would be similar to those of Alternative B, but in some cases less extensive. The size of the reservoir would increase by only 22 acres (20 percent). The length of the main dam would be increased, but only by 100 feet (15.4 percent). Its height would increase by 8 feet (15 percent). The control building would be the same as for the Proposed Action. The length of the saddle dam would also be increased, but only by 400 feet (100 percent). The saddle dam's height would increase by 10 feet (63 percent). As with Alternative B, the increased height of the two dams would only be visible from downstream when the reservoir is full. As the reservoir is gradually drawn down, the increased height would become more visible from the reservoir. The proposed access routes would remain the same as for Alternative B, as would the proposed campgrounds and powerline. The compatibility of the above features with the Forest Service visual quality objectives is discussed under Alternative B.

The effects of drawdowns on visual quality would be greater with Alternative C than with Alternative B.

The borrow areas may have greater impacts with Alternative C than with Alternative B. A smaller reservoir would inundate a smaller portion of the proposed borrow areas and thus expose more disturbed area to view. Over one-half of the borrow area, as currently proposed, would be exposed with the smaller reservoir, although it could be assumed that less borrow would be needed for a smaller reservoir.

Indirect Impacts - The stipulated agreement between the City and the Colorado Water Conservation Board would not pertain to Alternative C (see Section 4.3.2.3). The City, therefore, would not be required to maintain a minimum flow of 2 cfs. Visual impacts below the intake to the water filtration plant would be the same as these described under Alternative A.

4.11.3 Impacts Summary

Under Alternative A, the current visual nature of the Fish Creek Reservoir site would remain. Current visual conditions at the reservoir and low flow in Fish Creek would not be improved.

Alternative B would have both adverse and beneficial visual impacts. The most obvious beneficial impact visible from the campground and FDR 310 would be the increased size of the reservoir. Other beneficial impacts would include the rehabilitation or inundation of old borrow areas, the smaller drawdowns, due to remote operational control; and the stream channel rehabilitation downstream of Puppy Dog Lake. A beneficial indirect impact would be the maintenance of 2 cfs minimum flow in Fish Creek, downstream of the municipal treatment plant.

Short term adverse effects of Alternative B would occur during construction, which would not meet the Forest Service visual quality objectives of "modification" or "partial retention". Construction activities would be visible from FDR 310, a popular recreation route to Long Lake.

Under Alternative B, the most obvious long term adverse effect visible from Campground Relocation Site 1 and FDR 310 would be the increased length of the main dam. When viewed as middleground, however, the dam should meet the "modification" VQO. Other visual impacts include the campground, which would meet the "partial retention" VQO, and the borrow areas, which would meet the "modification" VQO, assuming they are adequately reclaimed.

Features that would not meet the "modification" VQO under Alternative B include the spillway and saddle dams as viewed from Puppy Dog Lake, the main dam and outlet control building when viewed in the foreground, the access roads, and the reservoir drawdowns. Only the latter two, however, would be visible from sensitive locations. Features that would not meet the "partial retention" VQO for the FDR 310 corridor would be the boat ramp, parking lot and the power cubicles along FDR 310, all of which would be in areas of high sensitivity. Although Campground Relocation Site 1 meets the VQO, full use of the campground would lessen the area's uncrowded, relatively pristine atmosphere, as would any future campground expansion. The Forest Service, however, would require mitigation such that visual quality objectives would be met (see Section 4.11.6).

Most of the Alternative C impacts would be similar to those for Alternative B, but in some cases less extensive. Exceptions would be the borrow areas, reservoir drawdowns, and flow in Fish Creek below the intake to the water filtration plant which would have greater impacts with Alternative C.

4.11.4 Connected Actions

Forest Service plans to improve access and recreational facilities in the Buffalo Pass area, as described in Section 3.9, would result in more visitors to the reservoir, which would lessen the relatively pristine, uncrowded atmosphere of the reservoir.

4.11.5 Cumulative Impacts

The number of visitors to the reservoir has increased with time, as access has improved, and would continue to increase as the Forest Service further improves access and facilities and as the expanded campground is constructed as part of the proposed project. The increasing number of visitors alters the visual appearance of the area due both to the presence of more people, as well as more signs of human use, such as trails, litter, dispersed campsites, and disturbed vegetation.

4.11.6 Mitigation Measures

The following mitigation measures would reduce the adverse effects of the proposed project on visual resources. In general, their purpose is to increase the compatibility of the project features with the Forest Service visual quality objectives. Where possible, mitigation would be required by the Forest Service to meet visual quality objectives.

- **Buildings:** All final siting and design would be approved by the Forest Service. The outlet control building should be a neutral, non-reflective color. A medium olive color, or natural wood, would enable the structure to blend in with the background trees as seen from the campground and FDR 310. Vertical siding would be more consistent with the vertical nature of the background trees than horizontal siding. Although rock facing should help the structure blend in with the dam, the use of painted wood siding would be more effective in blending the structure into the background, as viewed from the campground and FDR 310. The existing maintenance structure would be removed from the site. A new structure would be relocated to an area that is not visible from FDR 310 or the proposed campground. The campground's composting toilet should also have vertical wood siding, painted a neutral, medium-value color.

- **Access Roads/Parking Lot:** Road Corridor Option 1 would have the least adverse effects on visual resources. Roads should be located and designed to minimize cut and fill. The tops of cut slopes should be rounded to fit in with natural landforms. Vegetation would be planted to screen the access roads, parking lot and boat ramp from FDR 310.

- **Revegetation:** All ground disturbance would be revegetated as soon as possible after construction, including the powerline right-of-way. All roadway cut and fill slopes would be reseeded as soon as possible.

- **Borrow Areas:** Particular emphasis should be placed on restoring the borrow areas near the proposed campground to a condition as close as possible to natural conditions. This could include planting with several different grass species and replacing rocks and small boulders to recreate the existing level of visual variety.

- **Construction Camp:** The construction camp should be located in areas that would be inundated or disturbed by other activities, such as the borrow areas. The construction camp should not be located in the proposed campground site to avoid disturbing existing vegetation.

- **Campground:** As discussed in previous sections, the existing Granite Campground would be re-designed and re-located to meet Forest Service specifications and incorporate Forest Service visual quality objectives.

- **Clearing:** Tree clearing associated with all project features, including the dams, roads, campground, and powerline construction should be minimized. The existing vegetation above the reservoir high water line and at the toe and sides of the dam should be retained, where possible. The edges of any tree clearing should be feathered, especially for access roads and the powerline.

- **Spillway:** Cut slopes in bedrock should have a broken-faced finish to increase texture. The spillway should be designed to match natural contours, where possible.

- **Power Cubicles:** Power cubicles should be painted a medium-value, olive green to blend boxes into surroundings. Cubicles should be screened and located out of sight, where possible, such that the Forest Service visual quality objectives are met.

- **Mitigation:** Any structures required for fish and wildlife habitat or for wetland mitigation should be designed to reduce contrast with natural form, line, color, and texture, such as the use of rock facing or striations on concrete structures.

- **Construction:** All construction-related debris should be removed from the site between construction seasons and at the end of construction. Fugitive dust problems should be minimized by the use of water or other Forest Service approved techniques, especially along the Buffalo Pass Road. Use of night lighting should be minimized.

4.11.7 Unavoidable Adverse Impacts

Under Alternative A, current visual conditions at the reservoir and low flow in Fish Creek would not be improved. Assuming effective mitigation as descried above, all facilities would be designed to meet visual quality objectives under Alternatives B and C. One unavoidable adverse impact would be reservoir drawdown during late fall.

4.12 CULTURAL RESOURCES

4.12.1 Introduction

Cultural resources which could potentially be impacted by the proposed project were identified during the Class III Cultural Resources Inventory discussed in Section 3.12, Cultural Resources. According to this inventory, none of the five sites surveyed represent significant cultural resources.

4.12.2 Direct and Indirect Impacts

4.12.2.1 Alternative A - No Action

Under the Alternative A, the sites would be subjected to soil heaving and impacts caused by natural and human activities in the area.

4.12.2.2 Alternative B - Proposed Reservoir Expansion

As documented in the Class III Cultural Resources Inventory (MAC, 1992), it has been recommended that cultural resource clearance be granted for the proposed Fish Creek Reservoir expansion. Three aboriginal sites and two recent historical sites are within the project area, but all cultural resources have been evaluated as not significant and it has been recommended that they be considered not eligible for inclusion in the NRHP. It has additionally been recommended that no further archaeological investigations are necessary at these sites.

Survey strategies employed during the Class III inventory and limited testing (MAC, 1992) were adequate to discover all expected cultural resources. As a result, further work such as construction monitoring is not recommended. The State Historic Preservation Officer (SHPO) has recently concurred with this recommendation.

4.12.2.3 Alternative C - Smaller Reservoir Expansion

As aforementioned, it has been recommended that cultural resource clearance be granted for an expansion of Fish Creek Reservoir, if selected by the Forest Service.

4.12.3 Cumulative Impacts

No cumulative impacts would be associated with any of the three project alternatives.

4.12.4 Mitigation and Enhancements Summary

There would not be any mitigation necessary if Fish Creek Reservoir is expanded because none of the aboriginal or recent historical sites located within the project area represent significant cultural resources.

4.12.5 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts associated with any of the three project alternatives.

CHAPTER 5

LIST OF PREPARERS



CHAPTER 5 - LIST OF PREPARERS

5.1 ACZ ID TEAM

Jean Ray, ACZ Inc. - Project Coordinator, Water Resources, and Socioeconomics. B.A. in Biology and an M.S. in Civil Engineering with an emphasis in Environmental Engineering. Registered Professional Engineer in the State of Colorado with over 15 years of experience in engineering, environmental, water quality, and water resources analyses.

Rex Bell, ACZ, Inc. - Project Administrator and Socioeconomics. B.A. in Accounting and Business Administration. Over 12 years of experience in finance, accounting, and business management. Seven years experience in the environmental consulting business.

Alan Krause, ACZ Inc. - Dam Safety and Flood Hazard. B.S. in Geology from Pacific Lutheran University, M.S. in Engineering Geology from Mackay School of Mines. Geologic Engineer with over 15 years of experience in geotechnical engineering and environmental analyses.

Patrick G. Corser, ACZ Inc. - Dam Safety, Construction Safety, and Borrow Sources. B.S. and M.S. in Civil and Geotechnical Engineering. Professional Engineer with over 12 years of experience in geotechnical engineering and embankment design and construction.

Loren A. Labovitch, ACZ Inc. - Recreation, Socioeconomics, and Water Conservation. B.A. in Environmental Studies from the University of California at Santa Barbara. Environmental Technician with a broad background in a variety of environmental disciplines including hydrology, biology, sociology, natural resource management, urban planning, and environmental law.

Tom Leidich, ACZ Inc. - Transportation and Borrow Sources. B.S. in Mining Engineering from the Colorado School of Mines. Project Engineer with over 6 years of experience in mine planning, design of drainage and sediment control structures, and operation supervision.

Richard T. Burtell, ACZ Inc. - Project Alternatives. B.S. in Geology and M.S. in Hydrology. Hydrologist with 6 years of experience in hydrologic evaluations and environmental investigations.

Bob Peterson, ACZ Inc. - Conservation. B.S. in Geophysical Engineering from the Colorado School of Mines. Geologist and Geophysical Engineer with over 13 years of experience in mining, geotechnical, and environmental engineering; geologic and geophysical mapping; and environmental investigations.

Susan Ernst Corser, ACZ Inc. - Recreation and Visual Resources. B.A. and M.S. in Environmental Studies and Geography; MA in Landscape Design; and an M.U.P. in Urban Planning. Landscape Planner with over 13 years of experience in landscape and urban planning.

Tim Smith, ACZ Inc. - Field/Maps/Graphics. Associate Degree in Cartographic Drafting and professional course-work in computer geologic modeling and computer programming. Computer Specialist with over 11 years of experience in drafting, graphics, and computer applications in the environmental and engineering fields.

Matt Mathisen, ACZ Inc. - AutoCAD Technician. Associate Degree of Applied Sciences; Denver Institute of Technology, Civil/Geologic Drafting. Specialized courses in design technology. Adept in all AutoCAD applications, specifically in areas of mining, civil and geological engineering design. Complimenting his drafting capabilities, Matt is experienced in field activities and site work.

Thorne Clark, ACZ Inc. - AutoCAD Technician. Associates of Occupational Studies Degree in Computer Aided Drafting Technology. In-depth knowledge of several PC and Mainframe based mining, engineering and computer-aided drafting software programs. Thorne's background also includes field activities; data interpretation, and office support.

Cathy M. Carroll, ACZ Inc. - Word Processing. Over 12 years experience in office administration. Special word processing skills include design and editing presentation documents/reports; increasing speed and productivity by understanding and using advanced features of WordPerfect. Cathy also has a background in data entry, accounting, and field work.

Kathy Olsen, Lotus Design. - Graphic Artist. Bachelor of Science in Landscape Design and Construction; Completed several graphic workshops. Experience includes several years of visual assessment and landscape architecture and design.

Janet N. Shangraw, Hydro-Geo Consultants - Surface Water Hydrology. B.S. in Watershed Science/Hydrology. Certified Professional Hydrologist with over 12 years of experience in collection and analysis of hydrologic data, surface and groundwater studies and modeling, analysis of sedimentation and stream morphology, and evaluation of hydrologic impacts.

Vladimir Straskraba, Hydro-Geo Consultants - Flood Hazard. B.S. and M.S. in Geological Engineering from the Ostrava, Czechoslovakia School of Mines. Hydrologist with over 35 years of experience in hydrologic evaluations and water resources analysis throughout the world.

Noel Hobbs - Consultant - Water Resources and Conservation. B.S. in Civil Engineering. Registered Professional Engineer in the State of Colorado with 30 years of engineering experience focusing on extensive water rights and water resource planning and design for both public and private clients.

Steve Long, Cedar Creek Associates - Wetlands-Vegetation/Soils. B.S. in Wildlife Biology, an M.S. in Regional Resource Planning/Soil Science-Reclamation. Certified Soil Erosion and Sediment Control Specialist with over 17 years experience in the environmental field with 15 years of experience as corporate officer, project manager/strategist, revegetation specialist, soil scientist, revegetation field supervisor/coordinator, wetlands specialist, and vegetation/wildlife field technician.

T. Michael Phelan, Cedar Creek Associates - Wildlife/Fisheries. B.A. in Zoology from the University of California with postgraduate studies in biology and ecology from San Diego State University. Certified Wildlife Biologist with over 17 years of environmental, permitting, and NEPA experience.

Steve Viert, Cedar Creek Associates - Wetlands-Vegetation/Soils. B.S. in Wildlife Management, M.S. in Range Ecology, and an M.B.A. in Finance/Land Use Management. Certified Wildlife Biologist with over 15 years experience in permitting, range science, vegetation analysis, wetlands analysis, land use evaluation, impact analysis, and mitigation planning.

5.2 FOREST SERVICE ID TEAM

Wendy Schmitzer - Project Coordinator and ID Team Leader. EIS/Appeals and Litigation Coordinator for the Routt National Forest.

Sherry B. Reed - District Ranger of the Hahns Peak Ranger District, Routt National Forest. Recommending Official for this project proposal. B.S. in Wildlife and Fisheries Biology.

Ken Kowynia - Administration of Fish Creek Reservoir Special Use Permit. B.A. from the University of Denver and a M.F. from Colorado State University. Lands Staff for the Hahns Peak Ranger District, Routt National Forest.

Leo Snowden - Transportation. Facilities and equipment manager for the Routt National Forest.

Elizabeth Sue Struthers - Cultural Resources. B.A. in Anthropology and M.B.S. in Museology from the University of Colorado. Archeologist and cultural resource specialist for the Routt National Forest.

Tommy John - Soils. B.S. in Forestry and a M.S. in Soil Science. Soils Scientist for the Routt National Forest.

Michael Retzlaff - Socioeconomics. B.S. in Watershed Management and a M.S. in Economics. Land Management Planning Staff Officer for the Routt National Forest.

Tom Fratt - Fisheries, Wildlife, Wetlands. B.S. in Wildlife Management and Biology, and a M.S. in Natural Resources (Fisheries) from the University of Wisconsin.

Julie Anne McQuary - Recreation and Visual Resources. B.S. in Recreation and Park Administration from the University of Missouri and a Masters in Landscape Architecture (M.L.A.) from North Carolina State University. Fifteen years of professional experience in recreation planning and design and aesthetic resource assessment.

Rob Schmitzer - Recreation and Transportation. B.S. in Forest Biology from Colorado State University. Recreation Staff Officer/Supervisory Forester for the Hahns Peak Ranger District, Routt National Forest.

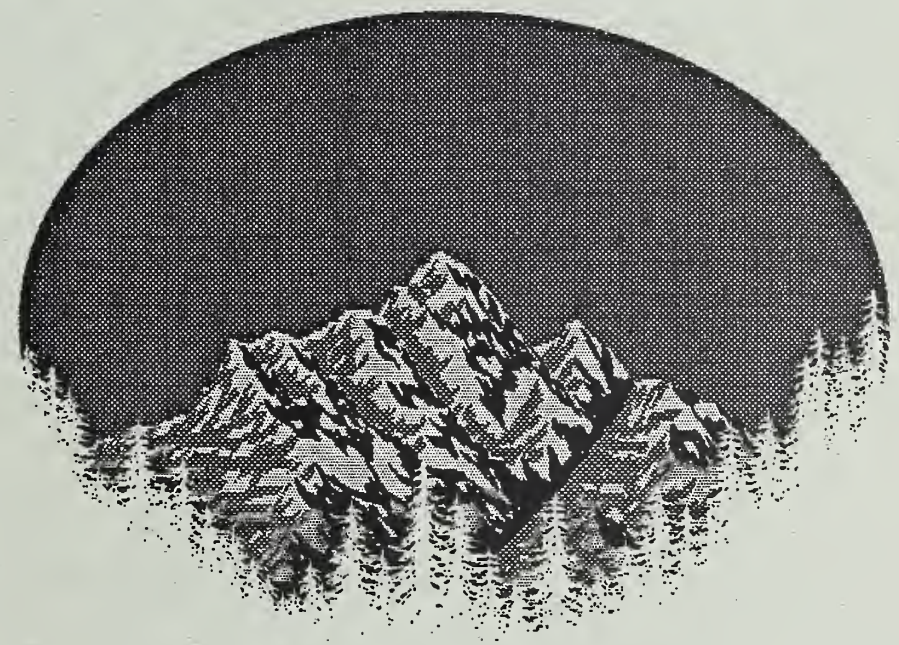
Neil L. Siettmann - Dam Safety and Construction; Flood Hazard. Graduate of the University of Wisconsin. Professional Engineer for the Routt National Forest.

Kirk N. Wolff - Water Quality/Water Rights/Conservation; Surface Water Hydrology; and Wetlands-Vegetation/Soils. B.S. in Forest Resource Management with an emphasis on Watersheds.

Trish Clabaugh - Need and Consequential Growth Impacts. B.S. in Recreation and Park Administration and a M.P. in Natural Resource Planning from the University of Wyoming. Social Scientist for the Routt National Forest.

CHAPTER 6

LIST OF AGENCIES, ORGANIZATIONS, & PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT



CHAPTER 6 - LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

6.1 FEDERAL AGENCIES

U.S. Environmental Protection Agency - Management Information Unit - Office of Federal Activities
U.S. Environmental Protection Agency - Region VIII
U.S. Department of Agriculture, Forest Service: Director of Environmental Coordination
U.S. Department of Agriculture, Forest Service: Regional Forester
U.S. Department of Agriculture - National Agricultural Library
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
U.S. Department of Interior - Office of Environmental Affairs

6.2 STATE OF COLORADO

Colorado Department of Health, Water Quality Control Division
Colorado Department of Natural Resources:
- Colorado Division of Wildlife
- Colorado Water Conservation Board
- State Engineer/Colorado Division of Water Resources
- Colorado Geological Survey

Colorado State Historic Preservation Office

6.3 OTHER GOVERNMENT AGENCIES

Routt County Commissioners
Routt County Planning Department
Routt County Engineer
City of Steamboat Springs
Steamboat Springs City Council
Mt. Werner Water and Sanitation District
Bud Werner Memorial Library

6.4 INDIVIDUALS

John Adams
Dale Baker
Mix Beauvais
Paul Beels
Greg Bell
Sally Bostrom
Joe Brennan
Donald Brookshire
Wayne Chase
Jim Chubrilo
Gene Cook
Pat Davey

Joanna Dodder
Bob Enever
Al Fox
John Geddie
Scott George
J. Mark Halvorsen
Dean Hitchens
David Hoefer
Kent Holt
Nancy Howell
Roy Hugie
John Hunt
John L. Kerst
Michael J. Korinek
Blake Lander
Brian Len
Anthony B. Lettunich
Thomas Lichtenfels
Pamela Martin
Mark McElhinney
Dave Meyring
John Morrone
Robert Moss
Laura Nemchuck
Michael Neumann
Emmett K. Olson
Mark Palmer
Chuck Porter
Ann Rich
John Ross
Tom Sharp
William Gary Shaw
John Spezia
Eric Steedman
Arienthe Stettner
Bob Stine
Jean Ann Swinehart
Russel & Shirley Thornton
Rich Tremaine
Don & Rita Valentine
Gigi & Johnny Walker
M.B. Warner
Robert G. Weiss
Loris Werner
Frederick D. Wolf

APPENDICES



APPENDIX A

DRAFT EIS COMMENT LETTERS AND RESPONSES

2-22-93

Sherry Reed
District Ranger
Hahns Peak Ranger District
P. O. Box 771212
Steamboat Springs, CO 80477

Dear Ms Reed:

I-A I object to the replacement of the current campground at Fish Creek Reservoir with **"A new state-of-the-art campground."** As it is now the campground is unique in that there is no drive-through traffic, and campers have to carry their gear 50 to 100 yards. According to your EIS, you plan to turn it into another Steamboat or Pearl Lake where Denverites can reserve campsites like a rock concert and park their Winnebagos right in the middle of the campground. Not exactly a wilderness experience!

I-B We have enough drive-in, drive-thru camping areas. If you can't preserve the uniqueness of this campground, I will have to oppose the project. I want one place left where I can camp with small children and not worry about traffic. That's one reason I go to the high country anyway, and a number of my friends feel the same way.

If I am wrong about the new campground, would you please send me the plans so that I can change my mind.

Sincerely,

Wm Gary Shaw

Wm Gary Shaw
Box 772776
Steamboat Springs, CO
80477

A. To the Forest Service, a "state of the art" campground means meeting accessibility standards; using current technology picnic tables, grates, and grills; and installing composting toilets. These modifications would allow for ease of maintenance, overall environmental benefits, and increased quality of experience.

B. The campground would be designed to accommodate separate walk-in campsites, very similar to the existing situation. There would only be four vehicle sites, located well away from the walk-in sites, to separate camping experiences. Figure 2-6, showing the proposed campground, is included in the FEIS.

Sheraton Steamboat
RESORT & CONFERENCE CENTER

March 23, 1993

Jerry Schmidt
Forest Supervisor
Routt National Forest
29587 West US 40, Suite 20
Steamboet Springs, CO 80487

RE: Fish Creek Reservoir Expansion

Dear Mr. Schmidt:

I am writing you to express the Shereton support for the Fish Creek Reservoir project.

2-A It is of obvious benefit to our Golf Course, which helps attract over 10,000 visitors to Steamboat every summer, but also to the 460 members that own homes and invest in our community. In addition, the Golf Course employs both seasonal and year-round staff.

2-B The security of having the storage capacity for our community domestic water usage as a hedge ageinst drought years is immeasureable, es well as providing a continuous flowing streem for recreetional purposes.

I strongly encourage the approval of this project, considering thet the benefits far outweigh the minimal impact of construction.

Thank you for your consideration.

Sincerely,

Charles W. Porter, CHA
General Maneger

CWP:pj

cc: John Fletcher
Don Valentine
Tom Sharp

A. Thank you for your comment.

B. Thank you for your comment.

ITT Sheraton
P O BOX 774808, STEAMBOAT SPRINGS, CO 80477
PHONE (303) 879-2220 FAX (303) 879 7686

John L. Kerst

P.O. Box 774724
Steamboat Springs, CO 80477

March 25, 1993

Mr. Jerry Schmidt
Forest Supervisor
Routt National Forest
29587 West U.S. 40
Steamboat Springs, CO 80487

RE: Fish Creek Reservoir Project in Routt County

I have followed the process on the development for the Fish Creek Reservoir and just wanted to voice some thoughts that I personally hold in reference to the expansion.

3-A As a citizen of Steamboat and a local businessman, it is extremely important that we plan long-term for a reliable, quality water system and I am of the opinion the Fish Creek expansion would accomplish this.

3-B The project also calls for a dam warning system at the Reservoir site which would enhance the safety features within the community. The expansion would also allow water to be dedicated to protect the instream flows enhancing Fish Creek as a fishery.

3-C Along the same line it is my understanding that a pool would be created in the reservoir which would allow fish to survive the winter in the reservoir itself.

3-D I realize the sensitivity of the wetlands issue, but the 15 acres of current wetlands that will be covered will be replaced with 22 acres of new wetlands.

I would encourage your consideration of this project and appreciate your quick approval going forward.

Thank you.

JOHN L. KERST

JLK:bh

A. Thank you for your comment.

B. Thank you for your comment.

C. Thank you for your comment.

D. Thank you for your comment.

FISH CREEK RESERVOIR DRAFT EIS
OPEN HOUSE
APRIL 1, 1993

HAHNS PEAK DISTRICT
ROUTT NATIONAL FOREST

4-A 1. FISH CREEK PROJECT WOULD RESULT IN ALL WATER RESOURCES STORED IN ONE PLACE. NEED TO DIVERSIFY.

4-B 2. INCREASED FLOOD POTENTIAL TO TOWN WITH INCREASED WATER.

4-C 3. WHAT IS THE AVAILABILITY OF BORROW MATERIAL ON-SITE? THERE WERE NO CLAYS IN THE SOIL FOR BONDING PURPOSES DURING THE LAST RESERVOIR ENLARGEMENT.

4-D 4. WHY ISN'T THE FOREST SERVICE REQUIRING CONSOLIDATION?

4-E 5. ARE WATER USERS WITH JUNIOR WATER RIGHTS USING WATER FROM FISH CREEK INAPPROPRIATELY AND IS THIS USE BEING MONITORED?

A. The City also maintains approximately 396 AF of water storage in Long Lake. Additionally, the City and Mt. Werner utilize the Yampa River Infiltration Galleries as a back-up water source for use during high demand periods. Please see DEIS and FEIS Sections 3.3.3.3 and 3.3.3.4.

B. An increase in storage capacity would not necessarily result in an increased flood potential. The increased safety features (ie. - additional, larger outlet structure; early warning system; remote operational control) incorporated into the expansion design are intended to decrease the potential for flood. The early warning system would be designed to monitor changes in pressure within the dam structures and changes in flow below the dams. At any indication of abnormal conditions, with the remote control operation and the larger outlet structure, the City would have the capability to release flow immediately from the reservoir. In the event, however, of a catastrophic dam failure with no early warning, the extent of damage would be greater with a larger reservoir (see DEIS and FEIS Section 4.2 and Table 4-1).
In addition, the existing dams, and any proposed expansion of the dams, would comply with all dam construction and safety regulations set forth by the Colorado Division of Water Resources and the State Engineer.

C. Recent geotechnical investigations, during the fall of 1992, indicated the availability of on-site borrow material. The borrow material meets the specifications for reservoir enlargement. Please see DEIS and FEIS Section 2.4.4.

D. The Forest Service does not have the authority to require consolidation between the City and Mt. Werner. However, the No Action Alternative, if selected, would require that the City and Mt. Werner consider other water supply strategies. Consolidation has been discussed by the City and the Mt. Werner Board of Directors. The Mt. Werner Board has decided not to pursue consolidation at this time, because it is not in the best financial interest of the Mt. Werner District.

E. During high flow periods, there is sufficient water in Fish Creek for water users with junior water rights. When the water in Fish Creek drops below the senior 8.3 cfs water right, flow is generally utilized by the City and Mt. Werner and is not available for junior users (see DEIS and FEIS Section 3.3.3.1). When the direct flow in Fish Creek is less than the demand, or when water has been released from storage in excess of demand, this additional water has been available for use by the junior water rights holders downstream (see DEIS and FEIS Section 3.3.8). The Colorado Division of Water Resources monitors the water use on Fish Creek. In the future, due to the stipulated agreement between the City and the Colorado Water Conservation Board, additional monitoring will be required to insure that instream flows are maintained (see DEIS and FEIS Section 3.3.3.3).

FREDERICK D. WOLF

March 31, 1993

Jerry E. Schmidt, Forest Supervisor
Routt National Forest
29587 West US Highway 40, Suite 20
Steamboat Springs, Colorado 80487

Dear Jerry,

Thank you for sending me a copy of the Draft Environmental Impact Statement (DEIS) for the proposed enlargement of the Fish Creek Reservoir. I appreciate and applaud your efforts to keep our community not only informed on these major decisions but also involved in them through the actions which the Forest Service has taken to encourage public input.

5-A I found the Draft Environmental Impact Statement to be particularly well done; I believe that it addresses and answers all of the relevant issues, has been well thought and is a comprehensive document. Your staff is to be commended on their work.

I support your proposed decision to accept Alternative B and believe that the DEIS logically and adequately supports that decision. I agree that this decision best balances community long term needs and environmental issues and in fact it appears that environmental issues are pretty minimal. Additionally, in view of the safety improvements involved in the new dam there is an added significant benefit to the community of reducing a risk, albeit remote, from an old and unmonitored dam with evidently a somewhat higher than average risk.

Sincerely,

Fred

Frederick D. Wolf

A. Thank you for your comment.

C. ROBERT ENEVER
PO Box 239
Steamboat Springs, CO 80477

April 7,1993

Jerry E Schmidt,
Routt National Forest
29587West US Highway 40,Suite 20,
Steamboat Springs, CO 80487

Fish Creek Reservoir Expansion
Draft Environmental Impact Statement

Sir,

6-A

The DEIS is deficient in that it fails to solve the problem of how to notify and evacuate the occupants of about 170 dwelling units directly in the path of a wall of water 28 feet high that will arrive at US 40 about 1 hour after a dam break. Assume that this will happen at 3am, when they are in their beds, and emergency response teams are asleep...

I am the owner of Fish Creek Mobile Home Park which has 65 dwelling units, but in addition the Seniors Apartments have 24 units., Chapparral Terrace has 12 units, Pine Grove Condominiums have about 65 units, I suspect the Pines Condominiums may be in the path with perhaps another 20 or 30 units and there are some homes. At 2 occupants per unit this would amount to about 340 lives

I am not against the dam expansion itself, and I recognize that the studies in the DEIS say a break shouldn't happen. But plenty of things engineered by man have caused disasters, because of errors, acts of God, or terrorism. We have to look no further than the Howelson building or the World Trade Center to know that disaster is possible.

I ask the question, "Is it beyond existing technology to devise a system that would warn these 340 people in their beds at 3am, and get them to high ground within 60 minutes of a break?". If it is possible, what are the available systems, and what are their costs?

I am optimistic that an economically viable solution can be found. If it cannot, the EIS should clearly state the nature of the risk, state that no solution has been found and state that some 340 lives would be at immediate risk in the event of a break from whatever cause. Other lives would be at risk downstream a few minutes later.

C. Robert Enever

C. Robert Enever

A. The purpose of the EIS is to disclose potential impacts of the Proposed Action and its alternatives. It is the responsibility of the City under its Emergency Preparedness Plan, in Appendix E of the DEIS and FEIS, to alert, and insure the safety of, downstream residents.

The Fish Creek Reservoir presently has no early warning system. Therefore, under the present system, no detection could take place in the event of disaster from errors, acts of God, or terrorism. Please also see response to 4B.

Comments on Fish Ck. Res. Draft EIS

7-A
7-B

I think this EIS, and reservoir enlargement is premature and the effects of actual water needs for the next 10 years should be gauged once the following section "I" conservation comments are put into place, and take effect - perhaps 2-3 years from now. I suggest that the city now purchase the remote control system and the early warning system, and installs these into the current reservoir in 1993. If future needs warrant these may then be re-installed into a larger, needed reservoir. The changes in dam outlet may be made at in 1993 (with the remote control system) to eliminate the Puppy Dog Lake erosion problem.

The FS should recommend alternative A- no action at this time.

Comments:

I Need for reservoir expansion for the city of Steamboat Springs is lacking from data in the document:

7-C
1 Population curve (figure 3-7) shows decressing growth per year trends in Steambost Sprigs. in the future.

7-D
2 There is an unknown effect of the decrease in water use per metered billing by use that is to be put into effect in 1993.

7-E
3 There is a great potential for more water availability through conservation by city funding of mandatory installation (and retrofit) for water efficient faucet/toilet/showerhead fittings (per Denver requirements) at lessor cost than a reservoir expansion.

4 There is a great potential for more water availability through water landscaping use restrictions (only certain days per week- per Denver) at zero cost.

7-F
5 Use of the recently financed/ constructed infiltration galleries during periods of peak use should take care of any real or perceived needs for the 10- 20 year future. A dilute use of this so called poor quality (just what is the chemistry of the water anyway) water in 10 -30 percent system dilution with regular sources should be of little problem.

7-G
6 Goleta California saw a 30% decrease in use through implementing some of the above measures (see Alt. 3, P. 17).

A. While the City and Mt. Werner are actively pursuing conservation measures (see DEIS and FEIS Section 3.3.9 and Appendix C), they still have the need to develop water supplies to assure water availability for present and future demands (see DEIS and FEIS Section 3.3.7).

B. The City, at this time, has not budgeted to construct the early warning system, remote operation system, new outlet structure, and modifications to the existing main and saddle dams. Costs for these improvements are estimated at approximately 1.3 million dollars. While the City has a strong desire to add remote operation and dam warning, this system would have to be prioritized among other pressing capital needs for the utility (such as the regulatory requirements for sludge management improvements). Under the Proposed Action, the City would not begin payment for the expansion until the year 2000. The City has agreed to this arrangement with Mt. Werner since it has no immediate need, yet has future needs, for additional water storage capacity (see DEIS and FEIS Sections 3.3.7 and 3.4.6.3). A benefit to the City, under this arrangement with Mt. Werner, would be the immediate construction of these reservoir improvements without immediate capital investments.

C. Figure 3-7 is not a population curve. Population curves, shown in Figures 3-17 and 3-18 of the DEIS indicate an overall increase in population for Steamboat Springs. While growth rates increased during the 70's and decreased in the 80's, recent trends indicate that growth is once again on the rise in the City (see DEIS and FEIS Section 3.4.4).

D. Metered billing is part of the conservation programs presently employed by the City and Mt. Werner (see DEIS and FEIS Sections 2.7.1 and 3.3.9 and Appendix C). It is anticipated that conservation could result in decreased water demands of 10 to 20 percent for the City and Mt. Werner. Please also see the response under 7A.

E. Conservation methods presently being pursued by the City and Mt. Werner are discussed in Sections 3.3.9 and Appendix C of the DEIS and FEIS.

F. The purpose of the infiltration galleries is to provide a point of redundancy to the water system and to provide a back-up water supply for peak demands. At this time, the ability to blend waters does not exist. See DEIS and FEIS Tables 3-7 and 3-8 for water quality data. Further discussion of the use of the infiltration galleries can be found in Sections 2.7.2, 3.3.4.2, and Appendix D of the DEIS and FEIS.

G. The Goleta water conservation program is often used as an example of the quantity of water that can be saved during extreme drought conditions and emergency situations. It resulted in a water savings of approximately 30% of the demand. It is estimated that the City's and Mt. Werner's water conservation programs could result in an approximately 10-20 percent savings in water demand (see FEIS Section 2.7.1). Please see DEIS and FEIS Appendix C for a discussion of the Goleta, City, and Mt. Werner water conservation programs.

II Cost- Who finances.

7-H

1 The need for this reservoir appears to be for the Mt Werner Water district. Why doesn't Mt Werner water come up with their own plan and their own financing for this need. I, as a ratepayer in the city water system, do not feel that I should be compelled to subsidize Mt. Werner water's needs.

7-I

2 Why doesn't the city and Mt Werner districts merge and thereby decrease the management and administrative costs incurred to the ratepayers.

III Remote Dam control and Early Warning system.

7-J

1 This document only considers such systems with the new expansion, and does not consider retro fit into existing dam. Why?

2 Isn't the cost of retrofit of these systems into the current structure less than that of the combined expansion and installation?

IV Puppy Dog Lake Drainage

7-K

1 Cannot the current dam be modified with a new spillway similar to that planned for the new dam, at lessor cost than combined expansion and new spillway?

V Wetlands

7-L

1 There is great impact from the amount of high altitude primary wetlands effected.

2 What is the ratio of replacement necessary (if even possible) of these wetlands with lose at low elevation for a true mitigation?

VI Yampa River T and E species: Humpback Chub, Bonytail Chub, Colorado Squawfish, and Razorback Sucker.

7-M

1 These T & E fish inhabit reaches of the Colorado and Yampa rivers downstream from Fish Creek. They depend on naturally occurring seasonal fluctuations in flow for their habitat. Any reservoir that inhibits, even to a small degree, this seasonal variation has some effect on their habitat.

2 With the existence of Yamcolo, Upper Stillwater, Stillwater, Gardner, Harper, Chapman, Crosho, Allen Basin, Sherriff, Killerney, Burnt Mesa, Chatfield, McChiums, Martin Creek, Overmen, Stagecoach, Catamount Fish Creek, Steamboat Lake, Willow Creek (Hahn's peak), Lester Creek, Nofstger, Nofstger Ziegler, Whetstones, Sage Creek, Temple, Emrich, Basin, Greasewood Flat, and Elkhead Reservoirs on the Yampa system this natural system has been already highly modified. Any new reservoir capacity must be considered under the cumulative impacts on these T & E species habitat.

H. The present reservoir expansion financial plan calls for a split in financing with the City funding 25% and Mt. Werner funding 75% of the proposed expansion costs (see DEIS Section 3.4.6.3 and FEIS Section 3.4.7.3). The City Council Resolution authorizing the City to share in the costs of the proposed reservoir expansion is presented in Appendix I of the DEIS and FEIS. The City supports this expenditure because it would share in the benefits of the expansion, including the early warning system and remote operational control.

I. Please see the response under 4D.

J. A Combination Alternative (which consists of water conservation, infiltration gallery expansion, and Fish Creek Reservoir upgrade) is addressed in Section 2.7.3 of the FEIS.

K. Please see response under 7J.

L. Replacement ratios for lowland mitigation projects can range from 3:1 to 1:1 (mitigation acres:impacted wetland acres) depending upon the type of area being converted to wetlands, the characteristics of the wetlands proposed to be created, and the presumed availability/dependability of a water source to support the mitigation site. Assuming successful "in-kind" mitigation which results in a fully functional wetland, a 1:1 ratio can be sufficient for "true mitigation". A 1.5:1 ratio, as proposed, is intended to provide a margin for areas which do not respond to mitigation activities such that a "function" 1:1 ratio, or higher, is attained. Please see the Wetlands Mitigation Plan, incorporated into the FEIS as Appendix K.

M. Please see responses under 18A and 18B. Please also see the Revised Biological Assessment (FEIS, Appendix J) which describes the effects of depletion on the Yampa River for the present reservoir and the proposed Fish Creek Reservoir enlargement.

VII Campground

7-N 1 Why are the city taxpayers expected to pay for improvements to the FS campground?

2 Most city residents do not want to see any more recreational "improvements" that will bring more traffic, pollution, people and hasales through town. Any new traffic will reduce the limited safety of on-road recreation (rollerblading, rollerskiing, cycling, jogging, hiking, mtn. bike access routes) in town and on adjacent county and FS roads. There have been at least 3 deaths on such roads in the recent past in recreation use - vehicle accidents. The most popular route to this "improved" campground will be via city streets, county roads and FS roads.

7-O

3 There will be construction/ personal (construction related) vehicle traffic on the city street in front of my house, and in front of school playgrounds over the summer. This should not occur for the above mentioned safety reasons. If any work is done a camp should be set up to minimize traffic. Daily commuting should not be allowed during construction phase.

Sincerely,

John Morrone
PO box 1151
Steamboat Springs, CO
80477

N. If Alternatives B or C are selected for implementation, the existing campground would be destroyed, and therefore must be replaced. As discussed under 7H, the City would pay for 25% and Mt. Werner for 75% of all construction-related costs (including the reconstruction of the camping facilities) associated with the proposed reservoir expansion.

O. Thank you for your comment. Either a construction camp or car-pooling will be required by the Forest Service if the proposed alternative is selected. Safety mitigation (including mitigation for Buffalo Pass Road) is outlined in Appendix K of the FEIS.

Sheraton Village Hotel
& Conference Center
The hospitality people of
ITT

P. O. BOX 774808
STEAMBOAT SPRINGS, COLORADO 80477
TELEPHONE (303) 879-2220

March 25, 1993

Mr. Jerry Schmidt
Forest Supervisor
29587 W. US 40, Suite 20
Steamboat Springs, CO 80477

Dear Jerry:

This letter is in response to the proposed expansion of Fish Creek Reservoir.

As the golf course superintendent at the Sheraton Golf Course, I favor the expansion of the reservoir to insure better flow in Fish Creek during the latter portion of the summer and late fall.

8-A With Fish Creek the dominant hazard on five holes of the golf course, anything that would increase the flow during these times would be welcomed. Both the sight and sound of Fish Creek are an important part of the golfing experience, and are missed when the spring runoff is finished.

The benefits of additional storage in a drought situation makes this project attractive. Being a Colorado native, I understand how arid our state is. Water storage is a priority
8-B when snow melt is the primary source of water for domestic use and recreation.

The proposed expansion of Fish Creek Reservoir has my wholehearted support.

Sincerely,

Robert J. Stine
Golf Superintendent

A. Thank you for your comment.

B. Thank you for your comment.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
Denver Federal Center, Building 56, Room 1003
P.O. Box 25007 (D-108)
Denver, Colorado 80225-0007

April 9, 1993

ER 93/157

Mr. Jerry E. Schmidt
Forest Supervisor
Routt National Forest
29587 West U.S. Highway 40, Suite 20
Steamboat Springs, Colorado 80487

Dear Mr. Schmidt:

The Department of the Interior (DOI) has reviewed the Draft Environmental Impact Statement (DEIS) for the Fish Creek Reservoir Expansion, Routt County, Colorado, and has the following comments.

Threatened and Endangered Species

9-A Neither the DEIS nor the Biological Assessment (Assessment) provided in Appendix J adequately address impacts to the four endangered Colorado River fish species (the bonytail chub, Colorado squawfish, humpback chub and razorback sucker). For example, both the DEIS and the Assessment state that timing and quantity of water releases from the reservoir could result in minor changes in downstream flow regimes which could affect the endangered Colorado River fish species. However, although it is well known that timing and quantity of flows do have an effect on these species, in addition to influencing proposed critical habitat, no analysis of these effects is provided in the DEIS. Furthermore, capturing of spring flows and slow release during the summer will exacerbate the problems already faced by these endangered species. Yet, in both the DEIS and the Assessment such effects are deemed minor and, therefore, dismissable. The Final EIS (FEIS) should describe the impacts of the project on the endangered fish.

9-B The DEIS makes no mention of water depletions which may result from this project. Although the Assessment does mention depletions from increased evaporation and recognizes that the project will result in a decrease of flow of water into the Yampa and Colorado Rivers due to consumption by Steamboat Springs, no impact analysis is provided. Furthermore, the Assessment concludes that, because the depletion is minor and may eventually occur anyway, there will be no effect on the endangered Colorado River fish. Because the U.S. Fish and Wildlife Service (FWS) has determined that any depletions in the Colorado River jeopardizes the endangered fish, the FEIS should address the potential impacts from depletions due to this project.

A. The DEIS and the BA did not indicate that the potential effects of the reservoir expansion are "dismissable". The BA did, in fact, reach a "May Affect" conclusion for the four Colorado River basin endangered fish species. (Please see page 8 of the BA in Appendix J of the DEIS. Please also see responses under 18A and 18B). The Revised BA is included as Appendix J of the FEIS.

B. The BA has been revised to include projected increases in evaporative loss and consumptive use of water available in the Fish Creek drainage. In addition, estimates of the extent of annual diversion required to fill the reservoir during the spring runoff period have been provided in the Revised BA. The Revised BA is included as Appendix J of the FEIS.

The DEIS also does not sufficiently analyze potential impacts to species in the project area which are candidates for official listing as threatened or endangered (Federal Register, Vol. 56, No. 225, November 21, 1991). Although the DEIS states that suitable habitat for the wolverine, lynx, northern goshawk, and boreal toad exists in the project area, and acknowledges that these species (and other furbearing species with potential habitat in the area) are nocturnal, secretive, and/or intolerant of the presence of humans, it dismisses the need for consideration of project impacts and possible mitigation because none of these species was seen in the project area (except for one northern goshawk which flew over), and because only a small amount of the potential habitat in the entire range of these species would be adversely impacted by the project.

These species are candidates because very little potential suitable habitat free from significant human disturbance remains. Disturbance of any potential suitable habitat is, therefore, significant and should be assessed whether or not there are records of sightings of the species in the area. The FEIS should address the impacts of increased human access and activity resulting from better roads and larger, modern campgrounds on potential habitat for candidate species in the area and on wetland or old-growth habitats. The only discussion in the DEIS regarding this issue is of a general nature and refers to the behavior of game animals (deer and elk) and hunters or to vehicular traffic. Also, the primary focus of the discussion is on the construction period rather than the potential long-term impacts of increased dispersed human recreation. We believe the most serious potential impacts are to boreal toad breeding habitat and northern goshawk nesting behavior.

9-C

While candidate species presently have no legal protection under the Endangered Species Act (Act), it is within the spirit of the Act to consider project impacts to potentially sensitive candidate species. Additionally, impacts on candidate species should be assessed in the event that any are proposed or listed prior to the time that all Federal actions related to the project are completed. The FEIS should identify the candidate species in the area and address the potential impacts of the project on these species.

By letter dated March 9, 1993, the Forest Service requested formal Section 7 consultation with FWS under the Endangered Species Act. The Biological Opinion prepared by FWS as a result of this consultation should be included in the FEIS and its conclusions incorporated into the FEIS analysis.

9-D

C. The DEIS states that potential habitat for the four candidate species discussed exists in the project area. The project area includes a much larger area than that potentially disturbed by reservoir expansion. As indicated on page 4-27 of the DEIS, no old-growth or other habitats preferred by northern goshawk, wolverine, or lynx would be directly affected by reservoir expansion. Page 4-27 of the DEIS does indicate that some potential boreal toad habitat would be inundated at the east end of the reservoir.

Loss of habitat for candidate species would be considered "significant" if the loss contributed to the further decline in populations of these species, which is not the case for the preferred alternative.

Field investigation does not indicate a serious potential for impacts to the boreal toad breeding habitat or the northern goshawk nesting behavior. No old-growth or mature forest stands exhibiting the canopy closure characteristics preferred by the northern goshawks occur in or near the potential disturbance areas, and no impacts to northern goshawk nesting behavior would occur. As indicated, small losses of boreal toad habitat would occur with reservoir expansion. However, no boreal toads were located in this area by field surveys. In addition, the wetlands mitigation plan, (DEIS page 4-18) calls for the creation of 1.5 acres of wetlands for every acre lost to mitigate wetlands affected by project development. As a result, more potential boreal toad habitat may exist in the project area after project development and successful reclamation.

Since no habitats preferred by northern goshawk, wolverine, or lynx would be affected, the only possibility for adverse effects would result from increased human presence associated with reservoir expansion. As indicated in the DEIS, access to the site is difficult. The expansion of the reservoir and existing campground (from 4 to 8 campsites) is expected to attract a few more summer visitors in the immediate vicinity of the reservoir but would not result in more than a minor increase in dispersed recreation in the general area.

The primary risks to wolverine and lynx would come from increased winter trapping pressure. Winter access to the site, however, would not be changed from the existing condition, and therefore, an increased potential for trapping mortality would not be anticipated with reservoir expansion.

We agree that it is in the spirit of the Endangered Species Act to consider potential project impacts to candidate species. For this reason, potentially affected candidate species were addressed in Sections 3.8.9 and 4.8.2 of the DEIS. These discussions are carried forward into the FEIS (Sections 3.8.9 and 4.8.2).

D. The Biological Opinion will be included with the Record of Decision.

Other Fish and Wildlife Resources

9-E

The DEIS states that wetlands would be inundated by the reservoir and destroyed or modified due to road construction and improvement, power line construction, and changes in flow from the reservoir and Puppy Dog Lake. However, the DEIS also states that impacts to wetlands have not, or cannot, be quantified or estimated. Nonetheless, to mitigate this undetermined impact, new wetlands would be created on a 1.5:1.0 ratio. The DEIS goes on to say that a mitigation plan has been submitted, but only provides a one paragraph description of that plan. The FEIS should fully discuss wetland impacts and mitigation.

In addition, because existing wetlands are partially formed by natural seeps and springs, the FEIS should discuss whether ground water mapping was conducted to ascertain if similar wetlands can be formed or sustained in carved out uplands adjacent to the fully filled reservoir (given such wetlands will require exposing or constructing new areas of ground water upwelling to the surface). Furthermore, there is no estimate of the length of time before newly created wetlands will be able to replace the functions lost, nor an assessment of the impacts to wildlife of the duration and extent of wetland loss (this is particularly important for the boreal toad). The FEIS should address these issues.

E. The statement that impacts to wetlands cannot be quantified was limited to the potential impacts to wetlands located downstream from Puppy Dog Lake. Other impacts to wetlands potentially resulting from the project have been quantified and are presented in Table 4-2 of the DEIS.

A summary of the Draft Wetlands Mitigation Plan was prepared to limit the verbage in Section 4.5 in response to the EIS concept of "tiering". The Draft Wetlands Mitigation Plan was referenced and is available in the administrative record for review by interested parties. The final Wetlands Mitigation Plan is also available and has been submitted to the Army Corps of Engineers with the 404 Permit Application and is included in Appendix K of the FEIS. Please also see response to 16C.

While groundwater mapping was not completed for this DEIS, a review of the Wetlands Mitigation Plan suggests that water to support these mitigation areas will come primarily from the lake itself in the form of sub-irrigation, flooding, and the retention of water behind berms following lake draw-downs. It can also be assumed that any seeps or springs remaining above selected mitigation sites following inundation will contribute water to these sites.

9-F The DEIS implies that this project occurs in old-growth spruce-fir forests (late seral in excellent and stable condition and trend, Table 3-19, page 3-70), and states that there is a limited amount of old-growth habitat in the vicinity of the project (page 4-26). Vegetation is assessed only in terms of its forage-producing ability (page 3-70) with no recognition of its value as wildlife habitat. The list of species and plant communities suggests a pristine, natural mosaic of high elevation forest-meadow habitats with a good interspersion of wetlands. In other words, excellent wildlife habitat and high biodiversity values. The impacts of the project on biodiversity and wildlife values in the vicinity should be addressed. Also, cumulative impacts to wildlife, wetlands, hydrology, and hydrography should be assessed. These analyzes should be included in the FEIS.

9-G Several public comments raised a concern for destruction of property as a result of the increased flood potential from failure of a larger dam and reservoir. The DEIS does not address either the potential flood damage to human infrastructure or natural habitat (the streams, river, and floodplain) and associated wildlife. This information should be included in the FEIS.

9-H The DEIS indicates that present reservoir capacity is adequate until 201u and that water conservation actions could extend that deadline. There is concern in the community of Steamboat Springs about the development implications of increased capacity in the reservoir and its impacts on open space and quality of life. Those impacts also will occur to wildlife and wildlife habitat in the Yampa River Valley and should be considered as part of the cumulative effects analysis in the FEIS.

F. The fact that the mixed conifer community is classed ecologically as "late seral" implies no judgement as to the age class and mixture of age classes of the overstory species. The classification simply implies that the community is not principally composed of species which dominate early- or mid-seral types such as brush species, aspen, or lodgepole pine. The contribution of Englemann spruce and subalpine fir to the overstory (despite a component of lodgepole pine) suggest that the community is approaching, though still quite distant from, climax. Furthermore, the age classes of these late-seral species, especially those proximal to the reservoir, do not predispose classification as "old growth" (few trees exceed 15" dbh and none were observed which exceed 24" dbh). In addition, the ratings of "excellent and stable" condition and trend are simply visual estimates which do not relate to the ecological stage of a forested community, but rather to the forage resources for livestock and wildlife as typically used by range ecologists.

The comment that a limited amount of old-growth habitat (exists) in the vicinity of the project is not correct. Page 4-26 of the DEIS, last paragraph, indicates that no old-growth habitat can be found in the area. Please note the sentence: "Recreational activities and the current lack of old-growth habitats in the vicinity of Fish Creek Reservoir reduce the potential for any goshawk nesting use of the project area."

The comment that "vegetation is assessed only in terms of its forage-producing ability with no recognition of its value as wildlife habitat" is also inaccurate. Please refer to the varied discussions presented under Section 4.8.2.2, pages 4-25 through 4-28 of the DEIS, where several comments regarding the value of wildlife habitat, and subsequent impacts, are addressed.

With regard to the impact of the project on biodiversity and wildlife values, two circumstances must be recognized. First, the zone of potential inundation exhibits less biodiversity and wildlife value than does the area immediately external to this zone, due to previous impact by man (see note on Figure 3-22 in the areas of disturbance). Second, any loss in upland wildlife habitat and biodiversity values will likely be compensated by the increase in aquatic habitats and values from increased reservoir expansion owing to the general paucity of large, surface waters and deep aquatic habitats in the vicinity of the project.

G. Please see the responses to 4B and 16N.

H. Increased human growth and land development would occur in the Yampa Valley regardless of the capacity of Fish Creek Reservoir (see DEIS page 3-62). Habitat loss, hunting and fishing pressure, and human disturbance of wildlife would increase under any growth scenario.

ment. The proposed project would not impact proposed
the Revised BA in Appendix

Wild and Scenic Rivers and Recreational Resources

9-I, 9-J

The DEIS does not adequately address the impacts of the proposed project on proposed Wild and Scenic Rivers segments downstream. The FEIS should include documentation of the project's impacts to those values that warranted inclusion of the proposed segments in the Wild and Scenic Rivers System. In addition, the DEIS does not identify impacts to recreational resources, such as boating on the Yampa River and in the Dinosaur National Monument. The FEIS should address these issues.

9-K

Finally, cumulative impacts from this project, as well as those from Stagecoach Reservoir, Lake Catamount, and other existing or proposed projects, were not addressed in the DEIS. The FEIS should include a cumulative analysis of the impacts of these projects on the resources discussed above.

Sincerely,

Robert F. Stewart

Robert F. Stewart
Regional Environmental Officer

cc: FWS/Denver
FWS/Golden
NPS/Denver

I. Thank you for your comment. The proposed project would not impact proposed Wild and Scenic Rivers downstream. Please see the Revised BA in Appendix J of the FEIS for discussion of flows in the lower Yampa.

J. Impacts to recreational resources are presented in Section 4.4. The proposed project would not impact boating on the Yampa River or in the Dinosaur National Monument.

K. Please see the Revised Biological Assessment included as Appendix J of the FEIS. Also see the Cumulative Impacts discussions under the various resource areas in Chapter 4.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

April 9, 1993

Regulatory Section (199375055)

Jerry E. Schmidt, Forest Supervisor
Routt National Forest
29587 West U.S. Highway 40, Suite 20
Steamboat Springs, Colorado 80487

Dear Mr. Schmidt:

I am responding to your request for review and comment on the Fish Creek Reservoir Draft Environmental Impact Statement (DEIS) which you sent to us on February 16, 1993. We have reviewed the subject document, and our comments are listed below.

10-A 1. Page 1-6: There are additional alternatives available to the City and Mount Werner, such as consolidation, purchasing of water from the City, purchasing storage space in the existing reservoir by Mt. Werner, constructing a unit process for polishing infiltration gallery water, and combinations of portions of the aforementioned alternatives. These alternatives may very well meet the water demand projections, and should be addressed as options under the Forest Service's no-action alternative.

10-B 2. Section 1.4.1.2: Suggest revising the section as follows:

The U.S. Army, Corps of Engineers (COE) is authorized by Section 404 of the Clean Water Act to issue permits for the discharge of dredged or fill material into waters of the United States at specified disposal sites. Waters of the United States includes all interstate and intrastate waters such as lakes, rivers, streams, sloughs, wetlands, wet meadows, natural ponds, and impoundments. Section 404 prohibits discharge of dredged or fill material into waters of the United States without a valid 404 permit.

Potential impacts to jurisdictional wetlands are reviewed and approved or denied under a site-specific individual permit application. An individual permit will be required for the expansion of Fish Creek Reservoir.

A. At this point in time, for financial and legal reasons the City and Mt. Werner have decided not to consolidate. (Please see response under 4D.) The City will not sell water or storage capacity to Mt. Werner under any long-term arrangement since the City needs this water to meet its long-term demands. Therefore, these options were not explored by the Forest Service in the DEIS as reasonable, practicable alternatives available to the Forest Service. A discussion of the infiltration galleries can be found in Sections 2.7.2 and 3.3.4.2 and Appendix D of the DEIS and FEIS. Neither the City nor Mt. Werner wish to utilize this system to a fuller extent or invest additional monies into this system, at this time. The infiltration galleries are intended to provide a point of redundancy to the water system and to be utilized as a back-up supply, when required. Both the City and Mt. Werner believe that the expansion of the reservoir supply is superior to the expansion/upgrade of the infiltration galleries to meet present and future demands. The Fish Creek supply provides the highest quality water in the area to the community through a gravity system. Further implementation of the infiltration galleries would require an additional treatment system. The capital, O&M (operation and maintenance), and environmental costs associated with the continuous pumping of water from the infiltration galleries into the distribution system are additional factors in the City's and Mt. Werner's decision to minimize the use of the infiltration galleries. A new alternative, the Combination Alternative (which consists of water conservation, infiltration gallery expansion, and Fish Creek Reservoir upgrade is evaluated in Section 2.7.3 of the FEIS.

B. Thank you for your comment. Section 1.4.1.2 is revised in the FEIS.

10-C

3. Page 3-34. The water providers in the Steamboat area are listed, however their sources and capacities are not listed. This is important information which should be included as other available sources of water especially since growth projections and future water demands also consider the potential of West Steamboat consolidation. If additional populations are considered, their water sources should also be considered.

4. Page 3-35. The mapping should show the location of the service areas for the "other providers".

10-D

5. Page 3-38 et. al. Should utilize one set of units such as acre feet for ease of reading and comparisons.

C. The other water providers in the area are minor and estimates indicate that combined they account for less than 5% of the total water demand. Additionally, these water users, with the exception of Treehaus and the Steamboat Ski Area, will likely eventually be tied into the City system. An agreement has been reached between the City and Steamboat II in which the City will provide water to Steamboat II in the near future. With water available to Steamboat II, the intervening area could also be served. Water demands for the ski area itself were not factored into the analysis. The demands from Treehaus are considered negligible, and should not impact the overall analysis.

D. It is customary to use AF in reference to reservoir storage and gallons in reference to usage or demand. It would be inappropriate to utilize gallons when referring to storage capacity and AF when referring to water usage. Additionally it would be difficult for the public to understand the magnitude of storage facilities in terms of gallons and/or the quantity of water used in terms of AF. The conversion from AF to gallons is presented in the Glossary of the DEIS and FEIS.

10-E

6. Page 3-41. The discussion on water usage should include comparisons with other similar communities. The 330 gallons per capita per day is extremely high, especially in comparison to other areas that also irrigate with tap water and are much drier, such as Grand Junction. We understand that Grand Junction per capita water usage is a little over 100 gallons per day. Similarly, Aspen's use ranges between 100 and 200 gallons per day. Steamboat Springs' average use should be studied and properly explained, since such higher rates are used to justify project need.

E. As discussed in Section 3.3.6.1 of the DEIS and in greater detail in the Water Resources Baseline Technical Report, per capita water usage in Steamboat Springs has been calculated in the following two manners:

- Based on "total" population (including tourists and permanent residents), resulting in a unit demand of approximately 210 gpcd (2,300,000 gallons per day/11,000 people). (Page 3-41 and Figure 6 in Appendix C of the DEIS incorrectly report the usage as 220 gpcd. This will be corrected to 210 gpcd in the FEIS)

- Based on "permanent" population (including only permanent residents), resulting in a unit demand of approximately 330 gpcd (2,300,000 gallons per day/7000 people)

To project future annual demands, the "permanent" population unit demand (330 gpcd) was multiplied by the permanent population projections presented in Table 3-17 and Figure 3-18. To project future monthly demands (and account for seasonal and tourism water usage), actual historical water usage patterns were utilized to determine the percentage of the annual demand used during each month of the year (see Section 7.1 of the Water Resources Baseline Technical Report). Thus, the assumption is made that future monthly trends in water usage will mimic trends of the last several years.

The "permanent" population unit usage of 330 gpcd is basically used as a tool to aid in the prediction of future use. The actual annual average usage in Steamboat Springs, however, is better reflected by the "total" population unit usage of 210 gpcd. When using this method, the actual water usage is divided by the total population actually using the water (tourists and permanent population).

Applying 330 gpcd to the "permanent" population yields the same results as applying 210 gpcd to the "total" population in Steamboat Springs. The most important factor in this analysis, however, is not the average annual per capita water usage. The important factor is the seasonal water usage and monthly trends for both the City and Mt. Werner and how it relates to available water supply. As discussed above, this seasonal usage has been factored into the analysis (see Sections 3.3.6 and 3.3.7 of the DEIS and FEIS and Sections 6.2, 6.4, and 7.1 of the Water Resources Baseline Technical Report).

Twenty resort/mountain communities were surveyed for the EIS (see Section 3.0 and Figure 6 of Appendix C of the DEIS and FEIS) to compare conservation programs and per capita water usage in these small towns. The average per capita usage (including tourists) in the towns surveyed was approximately 220 gpcd and ranged between 90 and 450 gpcd. This data indicates that the usage in Steamboat Springs of 210 gpcd is very much in line with water usage in similar communities.

This data was then compared with annual average unit usage in larger metropolitan communities (see Section 3.0 and Figure 7 of Appendix C of the DEIS and FEIS). The average per capita usage in the larger towns was approximately 175 gpcd and ranged between approximately 90 and 300 gpcd. The data indicates that the annual average per capita water usage in resort/mountain communities tended to be higher than larger metropolitan communities.

10-F

7. Page 3-42. Table 3-11 lists population projections with West Steamboat and Catamount induced growth included. There is not any backup information showing what assumptions were made to derive the numbers for the induced population growth from these two areas. The assumptions and derivation should be explained since it is critical for demonstrating the need for the project.

10-G

8. Page 3-43. Figure 3-11 shows the water usage throughout the year in the Steamboat area. It is noteworthy that, during the skiing season, the usage is about half of that during the summer. Therefore, winter tourism population increase does not appear to have any significant impact on available water when compared to the summer demand. This point may be sufficient to dismiss the winter transient population increase from any further consideration regarding project need. This should be clarified. On the other hand, the spike in the summer use, along with the extraordinary high per capita water use rate should alert the water districts to potential problems of water waste, and where to target conservation efforts. The highest storage requirements for the City under the moderate and high growth scenarios for 2010 occur in the summer months of July and August on Table 3-14.

F. Table 3-11 has been revised in the FEIS, and is discussed in Section 3.3.6.2 of the FEIS.

G. Thank you for your comment. This is discussed in further detail in Sections 6.2 and 6.4 of the Water Resources Baseline Technical Report. Seasonal water usage is also briefly discussed in Section 3.3.6.1 of the DEIS. A more complete discussion of seasonal/tourism water usage is presented in Section 3.3.6.3 of the FEIS.

10-H

9. Page 3-48. Table 3-13 shows low, moderate, and high growth water demand. The meaning of each should be explained. Does the moderate growth rate reflect a 3.2% growth rate with Steamboat population only, Steamboat with West Steamboat, or Steamboat, West Steamboat, and Catamount? The text on page 3-47 states that the numbers for table 3-13 were based on tables 3-10 and 3-11. How?

10-I

10. Page 3-49. Table 3-14 shows projected storage requirements based on tables 3-12 and 3-13. The results in table 3-14 are based on ambiguous population projections, and an extremely high per capita water use rate. A reconstruction of table 3-14 using 198 gallons per day per person (60 percent of 330), which is still a much higher rate than other western Colorado communities, and retaining the population growth rate assumed by the original developers of table 3-14, reveals that in the year 2010, the moderate combined growth rate demand would require 202 acre feet of storage, and the high growth rate demand would require 541 acre feet of storage. If you double each to account for losses, inefficiencies, etc., almost half of the present Fish Creek reservoir capacity would still be available and unused in the year 2010 in the high growth rate scenario, and much more in the moderate growth scenario. Hence, conservation to the upper level of other communities' use would be more than enough to allow the current reservoir to fulfil needs in the future, with the high quality water. If you assume a different population growth, such as the rate which occurred in the decade of the seventies (the steepest historical rate covered in the DEIS), the projected water demand would be even less in the year 2010 than the computed 541 acre feet. The computation for present need should be made using the 198 gallons per person per day for comparison, to see if current needs with conservation could be met without storage. Assuming that future needs in the Mount Werner service area would require storage or another source, there could be storage available in the existing Fish Creek reservoir which could be purchased or leased by Mount Werner even in the absence of consolidation. Other options for Mt. Werner could include blending Fish Creek in-stream flow source with the best quality infiltration gallery water it could obtain, or with sources on other creeks.

10-J

11. Page 3-47. The statement is made that long range planning horizons in Steamboat are very difficult. Fifty-year predictions are inherently difficult anywhere. Water planning for a fifty-year horizon can be done, and population projections based on past growth rates and available land space and zoning can be accomplished. The uncertainties in a fifty-year projection would be more understandable than the uncertainties presented in the twenty-year projection.

H. The low, moderate, and high growth scenarios presented in Table 3-13 of the DEIS correspond to the same scenarios (low, moderate, and high growth) presented in Table 3-11. The low growth scenario corresponds to a 1.6% annual growth rate and the moderate growth scenario corresponds to a 3.2% annual growth rate. The high growth scenario corresponds to the moderate growth rate with additional spinoff growth in Steamboat Springs from West Steamboat and Catamount (or approximately a 4.5 % average annual growth rate). Table 3-13 is based on the projected annual demands presented in Table 3-12 and the monthly historical usage presented in Table 3-10 as discussed above under the response to 10E and as presented in further detail in Section 7.1, Table 16, and Figure 18 of the Water Resources Baseline Technical Report. In summary, projected annual demands (based on projected permanent populations multiplied by 330 gpcd) were apportioned to projected monthly demands based on historical monthly usage. This was done to account for the seasonal trends in water usage experienced in Steamboat Springs and seasonal variations in the 330 gpcd annual average unit water usage. The FEIS (Sections 3.3.6.2 and 3.3.6.3) have been revised to clarify the growth scenarios utilized in the analysis and the impacts of tourism on water demands.

I. Thank you for your comment and analysis. See response to 10.E. For potential impacts of conservation, see Section 2.7.1 of the DEIS and FEIS.

J. Thank you for your comment. Forty year projections are be presented in the final EIS. Please see Sections 3.3.6.2 of the FEIS.

10-K

The statement is made that the city is currently utilizing 350 acre feet of the reservoir storage to meet its demands. Presumably this amount is for low water years when the city's instream flow rights are exhausted. This should be clarified. Also, a recomputation of the city's needs based on 198 gallons per day per person should be made to see if under such conditions any storage amount is needed.

K. This analysis is based upon comparison of present water demands with Fish Creek low flows and on water usage estimates done by the Division of Water Resources (see Appendix H of the Water Resources Baseline Technical Report). See response under 10E for unit usage discussion.

10-L

12. Page 3-51 and 3-52. The City's commercial consumers are planned to be charged for water on a declining block rate structure, however, Mount Werner's plans are to charge on a per cubic meter basis for commercial users. It appears that the City will be encouraging future water use rather than encouraging conservation. An increasing block rate structure for treated water and a decreasing rate structure for untreated water might encourage users who can access the untreated water from outside the Fish Creek drainage to do so, thereby leaving the very high quality water where it is most needed, and reducing storage needs. A conservation discussion in the EIS regarding rate structure an its rationale would be appropriate.

L. Since the completion of the DEIS, the City has adopted a rate structure which uses a single rate for commercial metered service. Commercial consumers will not be charged for water on a declining block rate structure as originally anticipated. The FEIS is updated and includes the adopted metering rate ordinance in Appendix H.

10-M

13. Pages 3-59 and 3-60. The curves of past and projected future population growth should be plotted on the same graph. Separating the two plots may appear disingenuous to some, especially opponents of the project. The anticipated growth spurts could then be presented and explained, and the growth rate resulting from normal population growth could be shown relative to past growth rates. The use of a bracketed field with future high-end and low-end boundaries for the projections could lessen the "numbers game" issues typically generated by discrete curves. Such presentation could prove to be more palatable to a wider spectrum of diverse interests.

M. Thank you for your comment. As you recommend, an additional figure (Figure 3-14 in Section 3.3.6.2) is presented in the FEIS.

10-N

14. Page 3-61. The curves showing the peak season population projections are legitimate, but if it will have an impact on the storage needs, then it must be integrated into the water needs projections. At this point, it appears that tourism water demand is seasonal. The tourist demand should then be computed on a monthly basis, and integrated into table 3-13, so that table 3-14 can reflect the demand as it may affect needed storage. Again, the comment about displaying future population projections in comment number 13 might be considered.

N. For a discussion of tourist population, see response to 10.E above. Also see Sections 6.0 and 7.0 of the Water Resources Baseline Technical Report.

We anticipate that issues of purpose and need, alternatives, and wetlands impact mitigation will also be subjects of comment when we issue a public notice on the Department of the Army permit application. We assume that the Forest Service, as an administrator of the public lands and as lead agency under the National Environmental Policy Act, will give special scrutiny to these issues, especially regarding need. We appreciate the opportunity to review your document. If you have any questions, please contact Nick Mezei of this office at telephone number (303) 243-1199.

Sincerely,

Grady L. McNure
Chief, Western Colorado Regulatory Office
402 Rood Avenue, Room 142
Grand Junction, Colorado 81501-2563

United States Department of Agriculture
Soil Conservation Service
P. O. Box 773389
Steamboat Springs
Colorado 80477

April 12, 1993

Jerry Schmidt
Forest Supervisor
U.S. Forest Service
Steamboat Springs, CO

RE: Fish Creek Reservoir Enlargement DEIS

Dear Jerry,

The following are the Soil Conservation Service comments for the Fish Creek Reservoir.

II-A 1. I would like to see a more detailed soil survey done around Fish Creek Reservoir. Many of the soils are complexes or associations and the descriptions are vague.

II-B 2. I would like to see either the Forest Service or the Corps of Engineers require that the wetlands that are disturbed, be replaced with **In Kind** wetlands not just a pond.

Thank you for this opportunity to make comments.

Sincerely,

Patrick R Davey

Patrick R Davey
District Conservationist

A. For the proposed project, it was determined that existing soils information, provided by the Forest Service, would be sufficient to describe the soils within the project area and assess the potential impacts. A detailed survey around the reservoir would provide additional data, but would not likely result in a change in the soils discussions provided in Chapters 3 and 4 of the DEIS. Additional soils data could, however, assist in the discussion of the potential for reclamation success. Topsoil would be saved for reclamation and revegetation as part of the construction plan and overall mitigation requirements of the project.

B. "On-site, in-kind" mitigation (1.5:1 ratio) is the primary type of wetlands mitigation being proposed for the project. Wetland purchase and preservation (10:1 ratio) is being considered as a supplemental form of mitigation. No ponds, as such, are proposed to be constructed. Please see the Wetlands Mitigation Plan submitted to the Army Corps of Engineers for their review and included in the FEIS as Appendix K.

PO Box 880220
Stmbt Springs,CO 80488
April 12, 1993

Jerry Schmidt, Forest Supervisor
Routt National Forest
29580 West US Hwy 40, Suite 20
Steamboat Springs, CO 80487

Dear Jerry:

The Fish Creek Reservoir Expansion DEIS was an informative and well-organized document.Thank you for the opportunity to review it and to submit our comments regarding this project.

We do find several oversights and concerns.

12-A 1. Is doubling the size of a reservoir located upstream from Steamboat Springs really safe or prudent? Yes, there will be new hi-tech warning
12-B systems, but can they ever be adequate? This is a major concern. Also, nowhere was mention made of the life of the new dam, maintenence requirements, and operating costs.

12-C 2. There was no mention made of the efficiencies in management and costs that would be created by consolidating the City and Mount Werner Water Districts. This should be a condition of the project. Refer to my letter to your offices dated 4/3/92.

12-D 3. How is the water currently allocated? What is the current shortfall? We need numbers and graphs here. According to the DEIS there is enough water for the City until the year 2010 even with population increases and current unmetered water usage rates.

12-E There was no clear description or plan for how the additional water resources in Alternative B would be used,in what priority, how much, and by whom. This information should be required.

12-F 4. There must be a condition for the Forest Service that the City of Steamboat Springs have a detailed growth management plan for the next 50 years in place that shows the allocation of this proposed water resources. It would include a hydrograph of the reservoir showing projected drawdowns, conservation pool, etc. At present, there is no plan, only a projection of more water users.

12-G 5. There must be a requirement that the City of Steamboat Springs implement water conservation measures like those reviewed in the DEIS, regardless of the course of action chosen. It is prudent that we use all resources efficiently no matter how abundant they appear to be.

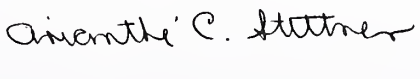
12-H In conclusion, we are not convinced there is demonstrated need for the reservoir expansion at this time. There are less costly alternatives and much homework to be done by the proponent before taking that course of action.

Sincerely,

Paul Stettner



Arianthe C. Stettner



A. Please see the response under 4B.

B. The useful life of the new dam is essentially unlimited with proper maintenance and periodic rehabilitation. Similar dams in Colorado are over 100 years old. Forty-year water demand projections have been utilized in the analysis for the determination of required reservoir storage capacity. The City anticipates that less than 100 hours per year would be spent on reservoir operations. This translates to an annual cost of approximately $3,000. With remote operation, this amount could be decreased. Present maintenance consists of road repairs, removal of dead fall from roads, removal of debris from the spillway, and removal of brush and trees from the dams. The City anticipates that maintenance would not change significantly with the expansion. Estimated maintenance costs are approximately $1,500 annually.

C. Please see the responses under 4D and 10A.

D. This is discussed in Sections 3.3.6 and 3.3.7 of the DEIS and FEIS.

E. Water storage requirements for the City and Mt. Werner are discussed in Section 3.3.7. As discussed in Section 3.4.7.3, the water storage capacity received by each entity would be proportional to the share of the project for which the entity pays. Therefore, Mt. Werner would receive 75% of the additional storage capacity and the City would receive 25% of the storage capacity.

F. The Forest Service has recommended, in Section 4.4.4 of the DEIS and FEIS that the City and Mt. Werner complete comprehensive 20-year water system master plans and wastewater system facility plans. The City is presently preparing a water master plan. While the Forest Service does not have the authority to impose long range planning on the City or the County, community desires for long-range planning within the City and County should be presented to the City Council, County Commissioners, City and County Planning Departments, and City and County Planning Commissioners.

G. The conservation programs for the City and Mt. Werner are presented in Sections 2.7.1 and 3.3.9 and Appendix C of the DEIS and FEIS. While the Forest Service supports these programs, it does not have the authority to enforce them.

H. Thank you for your comment. Project needs are presented in Section 3.3.7 and alternatives are discussed in Section 2.0 of the DEIS and FEIS.

Memo 4/12/93

To: Hahns Peak District Ranger's Office
Routt National Forest
Steamboat Springs, Colo
Attn: Ms. Wendy Schmitzer

From: Ben Beall, Routt County Commissioner Dist. 2

Subject: DEIS Fish Creek Reservoir

Reference: Conversation with Ms. Schmitzer

Wendy,

I am writing this memo as you suggested in order to have the EIS state that this enlargement of the Fish Creek Reservoir will not preclude the expansion of skiing into the Fish Creek drainages if and when northerly ski expansion is proposed by the Steamboat Ski and Resort Corporation.

13-A I have talked to both John Fetcher and Vern Greco regarding my concern that the previous Forest Service Plan contained wording that might hinder expansion into the Fish Creek drainages. Concerns about water quality were orginally expressed when another party was considering a ski area in this area. Both the parties above admit that management techniques exist that would minimize impacts.

A large part of the economy Steamboat Springs and Routt County is based on the skiing industry. It is imperative that future infill expansion where infrastructure already exists not be hindered.

Respectfully Submitted,

Ben Beall, Routt County Commissioner Dist. 2

A. Under the Proposed Action, the Forest Service would require that Best Management Practices be utilized during construction activities to insure that water quality in Fish Creek is maintained. The Forest Service has received an application from the Steamboat Ski Area for expansion and is presently undertaking an analysis of the expansion proposal. The proposed Fish Creek Reservoir expansion would not preclude Ski Area expansion.

John O. Ross
P.O. Box 771766
Steamboat Springs, CO 80477

Mr. Jerry Schmidt, Forest Supervisor
Routt National Forest
29580 West U.S. Hwy 40 Suite 20
Steamboat Springs, CO 80487

Dear Mr. Schmidt,

Following are my comments regarding the Draft Environmental Impact Statement (DEIS) for the Proposed Fish Creek Reservoir Expansion, Routt County, Colorado.

I believe the DEIS is deficient in the following portions not in any order of importance.

14-A

Table 3-16 Population on Page 3-57 shows that permanent population in Steamboat Springs grew from 2,340 to 6,695 from 1970 to 1990 or 3.86 times; Routt County population grew from 6,592 to 14,088 or 2.14 times during that time. During this same period the Ski Area growth in Skier Days was over 8 times. Obviously Skier Day growth and population growth are not directly proportional in Steamboat Springs or Routt County. Also, water use for 1985 thru 1991 per Figure 3.13 is almost constant for Steamboat Springs and Mt. Werner combined, even though this was the period during which the Steamboat Ski Area use reached 1 Million Skier Days per season and maintained that level for at least 3 years. Obviously the City's growth projections in Figure 3-18 do not reflect the facts of population growth cited above. These population projections should be revised by the City, and not include the assumption that the Lake Catamount project will cause so much growth in Steamboat Springs.

A. The high growth population projections provided by the City indicate a dramatic increase in peak season population between 1990 and 1995, and then more closely parallelling the moderate population growth. See the response to 10.E for a description of how population projections were utilized to determine future water demands.

The City Water Service Area in Figure 3-9 does not include the service to the area south of the City known as the Alpine Land property and the golf course approved by Routt County on the old Lufkin property. Both areas have been the subject of discussion with the Steamboat Springs Planning Commission and/or City staff. The City should be required to designate what they actually need this storage for or the No Action Alternative A be the decision of the Forest Service. To just have the City say they need more water for some undefined future use is not adequate to justify the City's participation in this project, unlike Mt. Werner's demonstrated need.

14-B

On Pages 1-4 and 3-47 the DEIS plainly states the City does not need additional water storage even with the inflated population growth projections. This is further reason there is no need for the City to participate in this project and the No Action Alternative A should be the Forest Service's decision for the City's portion of the project.

14-C

B. New information pertaining to 20-year and 40-year planning horizons, and the associated water planning areas, are presented in Sections 3.3.5 and 3.3.6 of the FEIS.

C. See the response to 7H

14-D

Figure 3-4 Flood Inudation Map is too large in scale for people living or working along the borders of the flood area to determine which but the most obvious locations would be flooded by a dam break. Also, the calculations of the Inudatlon Area under 3.2.7 Flood Hazard, page 3-12 states that "If the dam breached during an already existing flood, the water levels would be significantly higher and likely exceed the 500 year flood levels." However, the map in Figure 3-14 does not show this conditin. Dam break is most likely to occur durlng spring run-off when the dam and ground have the most chance of being water saturated, the reservoir would be at or near full level, and Fish Creek would be at flood levels due to snowmelt below the dam and possibly from the reservoir. Accordingly, the map in Figure 3-4 should be re-drawn to reflect the full-reservoir/stream-at-flood-level condition to reflect the worst case condition. For the residents, tourists and City staff to be aware of possible flood inudation areas from dam break, the map in Figure 3-4 should be drawn on the City's 2 ft. contour maps within the City boundaries. Finally, the City

14-E

should be required to provide personal llability and property damage insurance for those areas subject to flooding with resultant property damage and possible loss of life.

Although Air Quality is not addressed because Steamboat Springs is still not designated as a "Non-Attainment" area in spite of 4 violations of the Federal P.M. 10 standard

14-F

over the past 3 years, it must be addressed to protect the health of local residents from further growth in the Area. It makes absolutely no sense that one branch of the Federl Government can't enforce the Federal Air Quality Act because another Federal Agency isn't doing it's job (E.P.A.).

D. Larger scale maps are available in the Administrative Record.

E. No precedent in this area has been set. This concern, therefore, should be brought before the City Council.

F. Air quality concerns associated with the proposed project are addressed in Sections 4.2.2.4 and 4.11.2.2.

Over the past approximately 5 years the government of the City of Steamboat Springs has a miserable record for not completing major projects within budget or functioning correctly if at all. For example:

The collapse of the new Howelson Hill Lodge just weeks after it's dedication.

The second attempt at building an Ice Skating Rink that will keep ice frozen was not able to freeze ice during the daytime starting in early March, 1993.

In building the main Trail System trail, two sections had to be torn up and rebuilt, one key bridge was too low and had to be replaced, the culvert underpasses are very

14-G dangerous because of the trail design, and the whole thing is grossly over budget.

The tennis bubble, recently completed, rains from condensation during the winter, has water running thru it at times, and the last year's landscaping is already dead.

As mentioned above, in spite of Steamboat Springs City Council President Mary Brown being on the Governor's Air Quality Commission we continue to have P.M. 10 violations and have not been designated an air quality "Non-Attainment" area.

With this record of almost complete failure to get construction projects done safely and within budget, I don't see how the City Government can be reasonably expected to build a safe new Fish Creek Reservoir dam which should it fail would make the Howelson Hill Lodge collapse look like a

G. Thank you for your comment. In addition to the on-site inspectors for the design engineer and the contractors, a Forest Service inspector position will be required and will be funded by the proponents.

church picnic by comparison. In the Steamboat Springs Home Rule Charter accepted November 6, 1973 one of the City Manager's duties is defined as "(j) Provide for engineering, architectural, maintenance and construction service required by the City." Therefore, to protect the Residents and Visitors in Steamboat Springs, and because this proposed dam is not large enough to require full time independent engineering/construction observation, under Mitigation the Forest Service should require a) that the contracting governmental entity (City of Steamboat Springs) pay for a full time engineering/construction observer selected by and reporting directly to the Forest Service and the State of Colorado and not the City of Steamboat Springs and with no functional responsibility to the City of Steamboat Springs and b) that the City of Steamboat Springs be required to carry adequate personal liability and property damage insurance to protect residents and visitors in case of dam failure.

14-G cont.

Appendix G which is Case #92CW023 calls for an Agreement between the City of Steamboat Springs and the CWCB. In at least two places in the DEIS, representations from the City of Steamboat Springs refer to such an Agreement. However, there is no such document from the CWCB and the DEIS should have an agreement document from both parties confirming the same Agreement.

14-H

H. This Agreement is included in Appendix G of the FEIS.

Much is made in the local press by representatives of the City of Steamboat Springs and the Mt. Werner Water and

14-I

I. Additional public access below the water filtration plant is being pursued by the City and Mt. Werner.

Sanitation for the advantages of increased year around stream flow in Fish Creek. Since much of Fish Creek within the City flows thru the Sheraton Golf Course and The Sanctuary subdivision, required Mitigation should include Public Access to Fish Creek in these areas to enjoy the publicly funded water supply.

14-I cont.

With increased year around water flow, there may be enhanced conditions for fish spawning and growth downstream from the dam structure just below the filtration plant. To protect spawning trout, which already use Fish Creek in the spring, Fish Creek should be closed to fishing during all spawning seasons, with this requirement covered under Mitigation requirements placed upon the City.

14-J

Thank you for this opportunity to comment.

Yours Truly,

John O. Ross

J. Such restrictions must be made by the Colorado Division of Wildlife.

RE: DEIS for Fish Creek Reservoir

Dear Jerry,

15-A I am for the enlarging of Fish Creek Reservoir if the water is truly needed for the future and the City District and Mt. Werner Dist are forced to consolidate into one District and Mt. Werner people are allowed to run the new District.

The following are my personal comments as I read the DEIS.

15-B 1. Mr. Fetter told me at the public meeting that the reservoir enlargement was not being done to enlarge the Districts. Now I am hearing that the City is running water to Steamboat II and Mt. Werner is willing to supply water to the golf course south of town. If areas are not found on the Fig 3-9 page 3-35 then water should not be allowed to service that area in the future.

15-C 2. In the DEIS it was mentioned several times that $80,000/yr was . . . being spent by Mt. Werner already for the reservoir enlargment. It sounds to me that Mr. Fetter and the Mt. Werner board jumped the gun!

A. Thank you for your comment.

B. Please see the response under 14B. A water service area has been identified and master planning is presently underway.

C. In order to take advantage of low interest rates, Mt. Werner elected to secure a loan for the project prior to Forest Service approval of the Special Use Permit. The loan and proposed financial arrangement are discussed further in Section 3.4.6.3 of the DEIS.

15-D

3. If Mt. Werner "borrows" 20 A.F. of water from the city yearly, why doesn't the city charge Mt. Werner for the water?

D. The City has not felt it appropriate to charge Mt. Werner for this minimal water usage.

15-E

4. Why does the city "give" (rebates) Mt Werner $200,000/yr. when Mt. Werner no longer has a mill levy?

E. The $200,000 per year that Mt. Werner receives from the City through the year 1999 stems from an agreement executed in 1983 between the two entities, which provided bond funding for the City's expansion to Mt. Werner's filtration plant. The repayment of the bond issued required imposition of a 3.7 mill levy on the entire city, which included Mt. Werner residents. It was therefore necessary to rebate Mt. Werner the property taxes collected within its boundaries for the City's plant expansion.

15-F

5. Why does Mr. Tether have the power to give or sell water to the Sheraton golf course, when Mt. Werner is out of water and the water really is the excess water released by the city. The golf course should should be paying for what they use, just like I have to. This goes for the users on the Hoyle & Knight Ditch, Albert A. Mann Ditch and Alma Baer Ditch. A fair A.F. price should be charged. It is estimated that it will cost $2600/A.F to enlarge the reservoir and the life 40 years $\frac{2600}{40} = \$65/A.F./yr.$ or greater.
The city needs to require these other users that are stealing water put in some type of measuring devices and be checked frequently. If they are using more water than judicated and have not paid for they should be fined heavily.

F. The Sheraton golf course diverts irrigation water directly out of Fish Creek under a flow right provided by Mt. Werner. Mt. Werner receives an annual payment of $4,000 to provide water from its system in case of failure of the Sheraton's intake system or inadequate supply. Please see the response under 4E for a discussion of other diversions.

15-G

6. Why was a detailed soil survey not done? Instead a class three inventory was done in 1988 instead of a class I. This should be done before the EIS is allowed to continue. I think a very site specific soils inventory is needed.

G. Please see the response under

15-H

7. I am very concerned with the quality of wetland mitigation that will be done. I see the mitigation at Stagecoach Reservoir and the mitigation looks like farm stockponds not like the wetlands that were lost. I hope the Forest Service will keep on top of the quality of these wetlands.

H. Please see the response under 11B.

15-I

8. If the enlargement is allowed, I would like to see the truck traffic be forced to go up Amethyst Drive and not through old town. County Rd 36 south of the Amethyst intersection is in very poor condition and has two very dangerous curves on it and no guard rails.

I. Truck traffic will use City Access Route 1, as identified on Figure 3-27. A memorandum of understanding is being drafted between the City and County to insure that all roads to the site are properly maintained.

15-J

City own 2/3 of the filtration plant but Mt. Werner uses 1/2 of the water, then the city gives Mt. Werner 20 Af. of water yearly free and also gives Mt. Werner $200,000/yr rebate. No wonder the city has to charge their users more than Mt. Werner users.

When is the inequity going to stop? I don't see it changing until the Districts are forced to merge by the taxpayers.

Sincerely

Pat Davey
P.O. Box 772278
SS. CO. 80477

J. The City and Mt. Werner believe that the agreement discussed under Response 15D was fair to both entities. Mt. Werner has, as of January 1, 1993 changed from a flat rate to a metered rate to encourage conservation and to provide additional needed revenues. This increase will reduce the gap between the City's and Mt. Werner's rates.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

APR 12 1993

Ref: 8WM-EA

Jerry E. Schmidt, Forest Supervisor
Routt National Forest
29587 West U.S. Highway 40, Suite 20
Steamboat Springs, CO 80487

Re: Fish Creek Reservoir Expansion, Draft Environmental Impact Statement (DEIS)

Dear Mr. Schmidt,

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Region VIII office of the Environmental Protection Agency (EPA) has reviewed the DEIS for the Fish Creek Reservoir Expansion project. EPA offers the following concerns and comments for your consideration as you complete the Final Environmental Impact Statement (FEIS) and your decision making process.

16-A EPA's primary concerns with the adequacy of the DEIS are the selection of alternatives related to the documented need for water supply, and the lack of mitigation detail and commitment. In particular, the discussion of what would happen under the No Action Alternative leaves open many issues that are critical to an informed decision. EPA believes that an alternative that would address the dam safety and operation issues, Puppy Dog Lake drainage issues, supply the project proponents with the necessary water supply, and result in the least amount of environmental damage (an environmentally preferred alternative) should be included. EPA believes that the majority of the information necessary to develop and present this alternative, so that it can be properly compared with the other alternatives, is available in the DEIS.

16-B It appears from the hydrology information presented in the DEIS that the project proponents actually need only 750 acre feet of storage to meet the worse case projected demands. The proposed project would create 2280 acre feet of storage. It also appears that the proponents have numerous alternatives (various water conservation techniques, use of existing infiltration galleries, purchase of storage from other sources, etc.) to meet this demand without construction of the reservoir expansion with the associated impacts. The Forest Service needs to be aware that the Clean Water Act, through the Section 404(b)(1) Guidelines, establishes a requirement of avoiding impacts to

A. The No Action Alternative, as presented in the DEIS, is a "baseline" case to compare against true action alternatives. It assumes the status quo, or the situation as it presently stands. If the No Action Alternative, as described in the DEIS, is selected by the Forest Service, mitigation would be required to correct the environmental damage to the Puppy Dog Lake drainage, under the terms of the Special Use Permit. Please also see the responses under 7B, 7J, and 10A.

B. Thank you for your comment. Project needs have been revised using a 3.2% annual growth rate and a 40-year planning horizon and are presented in Sections 3.3.6 and 3.3.7 of the FEIS. Additionally, Section 1.2, Purpose of and Need for Proposed Action, has been revised to focus primarily upon water storage capacity needs. Project benefits have been separated from the project purpose and need.

16-B cont.

waters of the United States when there are less damaging alternatives available. Given the available information EPA does not believe that the proposed project is needed at this time.

Detail on the proposed mitigation is lacking in several areas of the DEIS. In particular, while the DEIS acknowledges that a wetland mitigation plan has been prepared, the wetlands mitigation plan was not included in the DEIS. Also, while a conservation pool is being suggested, the actual volume of the conservation pool is left to be presented in the FEIS. The actual determination of both of these items are likely to affect the final project description to a degree that decisions on the selected alternative may be altered. The Council on Environmental Quality NEPA regulations (40 C.F.R. 1500-1508) state the DEIS must fulfill and satisfy to the fullest extent possible the requirements established for FEISs (40 C.F.R. 1502.9(a)). The purpose of a FEIS is to respond to comments (40 C.F.R. 1502.9(b).

16-C

This necessity to allow comment on the proposed mitigation at the DEIS stage is also reflected at 40 C.F.R 1506.6(d) (Agencies shall: solicit appropriate information from the public). Without providing the detailed proposed mitigation which the Forest Service would require as part of the final decision on any given alternative, the opportunity to comment on the mitigation's adequacy, effectiveness, appropriateness; or to suggest alternative mitigation; is hindered.

16-D

Based on the concerns stated above, the comments contained in the enclosed detailed comments, and the procedures EPA uses to evaluate the potential effects of proposed actions and the adequacy of the information in the DEIS, the preferred alternative identified in the DEIS for the Fish Creek Reservoir Expansion will be listed in the Federal Register in the Category EO-2. This means that EPA's review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. EPA believes the corrective measures will require consideration of a new alternative. Given the information presented in the DEIS, EPA believes that there are practicable, less damaging alternatives available to the applicant which would reduce the environmental impacts of the project.

C. The Wetlands Mitigation Plan is included in Appendix K of the FEIS. The Forest Service is presently working with the City and the Army Corps to develop an off-site mitigation plan for wetlands that will complement the proposed Wetland Mitigation Plan submitted to the Army Corps with the 404 Permit Application. Any agreement reached will be documented in the FEIS.

Overall project mitigation is presented by resource area and included in Sections 4.2.4, 4.3.4, 4.4.4, 4.5.4, 4.6.4, 4.7.4, 4.8.4, 4.9.5, 4.10.4, 4.11.6, and 4.12.4. Additionally, a Project Mitigation Plan is included in Appendix K of the FEIS.

The Forest Service is requiring the City to reach an agreement with the CDOW to allow for a conservation pool. Section 3.3.7 of the FEIS has been modified to include a conservation pool of 1030 AF. The conservation pool agreement will be included in Appendix K of the FEIS.

D. Thank you for your comment. The Forest Service believes that the preferred alternative is the most practicable available alternative which meets the Applicant's purpose and need. The environmental consequences, as described in Chapter 4, would be minimized with the described mitigation. In addition, the Forest Service believes that the net public benefit that could result, such as improved public safety, must be considered.

Detailed Comments by
Region VIII of the Environmental Protection Agency
on the
Fish Creek Reservoir Expansion
Draft Environmental Impact Statement.

16-E

PAGE S-5 - A Section 404(b) permit would be required. Section 404(c) of the Clean Water Act addresses EPA's authority to deny a Section 404 permit, not the Corps authority to issue a permit.

16-F

PAGE 1-1 - The DEIS uses an appropriate quote from NEPA as the lead in for several other chapters, presumably to focus the reader on the material to follow. EPA believes this is a very good approach and the Purpose and Need and Alternatives Chapters would benefit from addition of appropriate NEPA quotes. EPA believes the underlying (or basic) purpose of the proposed project is to supply water to the applicants. While the goals and objectives presented in Chapter 1 appear reasonable, they seem to reflect many "benefits" of the project after mitigation has been required, rather than the real "purpose" of the project. If the underlying purpose were defined more narrowly, the description of need and subsequently development of alternatives would likely be more concise.

16-G

2-7 - Who was the applicant for the Nash Reservoir? How many wetlands would be inundated?

2-10 - The basic assumption that the No Action Alternative describes the current condition of the existing reservoir and no corrective action has been taken by the Forest Service needs to be supported with documentation that this is indeed the case.

16-H

The discussion of the "mitigation" items under the No Action Alternative is interesting in that the Forest Service seems to be indicating that the No Action Alternative is really an action alternative to meet the needs of the applicant and the Forest Service. If the No Action Alternative would result in predictable actions to occur, these actions should be included as part of the No Action Alternative.

This section implies that most of the proposed project objectives in the Purpose and Need section are in fact Forest Service mitigation objectives, not applicant objectives. This section also seems to indicate that the Forest Service has the authority to obtain the Forest Service objectives (erosion protection, campground improvements, upgrade of service road and implementation of early warning and remote operation) through its existing authorities without the need to issue a permit for the proposed reservoir expansion.

E. Thank you for your comment. Correction will be made in the FEIS.

F. Project purpose and need should be redefined.
Thank you for your comment. The Forest Service concurs that the basic purpose of the proposed project is to provide for the present and future water needs of the City and Mt. Werner. Chapter 1.0 is revised to clarify the purpose and need of the project and the associated project benefits. Please also see response to 16B.

G. Mr. Merle Nash is the applicant. An Environmental Analysis Report was done by the Forest Service that required Mr. Nash to do additional wetland surveys. The Forest Service has not yet received a wetlands survey for the site. Forest Service personnel who have visited the site have indicated that the area proposed to be inundated is primarily wetlands.

H. Please see the response under 16A.

16-H cont.

The FEIS needs to document what the Forest Service would do under the No Action Alternative. Without this information the Forest Service decision makers, as well as any other decision makers who would like to rely on this document, will not have the necessary information to make an informed decision. This is a major weakness of the DEIS in that it does not allow the public to comment on any proposals the Forest Service would have concerning the No Action Alternative.

EPA believes the DEIS is the time when the Forest Service should formally define the "mitigation" requirements for the No Action Alternative. This decision is very pertinent to the impact comparison for the various alternatives in the DEIS and the public should be allowed to comment on this potential decision at this time. Otherwise a fragmented decision process will occur and no decision maker will have the benefit of the necessary impact information.

EPA recognizes the need to establish a consistent baseline for comparison of alternatives. Therefore, an option to including the "mitigation" items in the No Action Alternative would be to develop a new alternative which includes all the items contained as potential "mitigation" for the No Action Alternative. Another option which needs to be considered would be an alternative which derives its supply from purchase of existing instream and/or reservoir storage rights.

16-I

PAGE 2-14 - Would Fish Creek be diverted during construction? What is the change in flow regime from existing releases (in excess of demand) and the future condition?

16-J

PAGE 2-15 - The environmental impacts should mention impacts on animals other than fish.

16-K

PAGE 2-20 - A small hydro unit should be considered for power supply. This could be designed for relatively continuous operation, and should be able to keep any necessary batteries permanently charged. It does not appear that the power supply for dam safety and remote operation necessarily need to be totally reliable, and a hydropower unit may be as reliable as Yampa Valley Electric Association power. Reliability vs cost should be analyzed as well as a true analysis of potential of risk as a result of power failure.

16-L

TABLE 2-1 - Why would the no action Alternative result in increased recreational use and the reservoir need to be restocked? Why is this table in the alternatives section prior to any discussion of resources or impacts? What is the Buffalo Pass Capital Investment Project?

I. Fish Creek would be diverted through Puppy Dog Lake during construction activities. Construction would occur during the low flow period (late July, August, September, and early October) and flows are expected to remain well below the 20 cfs limit established by the Forest Service for Puppy Dog Lake drainage (see DEIS page 4-8). Without remote operational control, the City is only able to adjust the flow released from the reservoir several times a year. During certain times of the year, this has resulted in the release of several times the actual demand. With the remote control, the City anticipates that it will release approximately 1.25 times the demand (see DEIS Section 3.3.7).

J. Impacts to wildlife are presented in Sections 4.8.2 and 4.8.3 of the DEIS and FEIS.

K. A small hydro unit is technically and operationally impractical at this site where access to inspect the generator is limited to 4 to 5 months of the year. In addition, a hydro plant of this size would not be cost-effective.

L. The increase in tourism in the Steamboat Springs area, has resulted in additional usage of recreation areas, including the Fish Creek Reservoir. This trend is expected to continue in the future, whether or not there is an expansion to the reservoir. A summary table of impacts is generally found in Chapter 2 (see Shipley's "How to Write Quality EISs and Eas"). A discussion of the Buffalo Pass Capital Investment Project is found in Section 3.4 of the DEIS and FEIS.

16-M PAGE 3-7 - Use of the english measurement system throughout would be more readily understood.

16-N The flood hazard section presents information about what would happen if the reservoir fails but does not appear to address the very important issue of the probability of failure. The only information seems to be the conclusion that a new dam is safer than an old dam. From a public perception viewpoint, if flood prediction is to be proposed as a project benefit, a realistic comparison of the actual risk of failure of the existing dam needs to be presented. This information will allow the public to compare the cost associated with implementation of flood prediction facilities with the actual risk of a flood occurring. What flood/snowmelt recurrence event would probably cause dam failure for the various alternatives? Does the reservoir description on page 3-21 imply that the existing reservoir would not fail under probable maximal precipitation conditions? If so this should be clearly stated in the flood hazard discussion.

16-O PAGE 3-20 - At what point in the Fish Creek drainage were the peak flow estimates calculated?

16-P Is there a prediction of when Puppy Dog Lake drainage will reach stability under the existing conditions?

16-Q PAGE 3-21 - What are the irrigation uses of Fish Creek Reservoir?

16-R PAGE 3-25 - Where are the alternative points of storage for the Four Counties Water? What is meant by the statement that the City may obtain a portion of these rights for the proposed project? Could the applicant obtain all future supply from these rights?

16-S PAGE 3-27 - Figure 3-7 show numerous diversions below the Fish Creek Filtration Plant. What is the potential that the proposed 2 cfs instream flow below the Fish Creek Filtration Plant will reach the Yampa River? How many miles of stream would be enhanced by the instream flows? What type and amount of habitat/fishery would be supported with the 2 cfs flow? How much of this habitat would be available for public recreation/fishing?

16-T Why would the 763.1 AF of conditional storage rights not be exercised in the future?

16-U PAGE 3-28 - Why are the Burgess and Walton Creek water rights not used? What is the available supply from these rights?

M. Thank you for your comment.

N. The existing dams, and any proposed expansion of the dams, would comply with all dam construction and safety regulations as set forth by the State Engineer and the Colorado Division of Water Resources. Therefore, the discussions in Sections 3.2.7 and 4.2.2 and Table 4-1, and the subsequent qualitative discussions of dam safety, are acceptable to the Forest Service. Please also see response under 4B

O. See Table 3-3 on page 3-19 of the DEIS for description of sites.

P. Due to the extreme variation in peak flows, it is not expected to stabilize under the current operational regime.

Q. Water from Fish Creek Reservoir is used by the City and Mt. Werner for municipal purposes and not for agricultural irrigation purposes. Lawn watering by individual users, however, does occur.

R. It is anticipated that the Upper Yampa Valley Water Conservancy District will transfer a portion of their Four Counties water rights to the City. This will allow the City to fill the reservoir under a more senior decree than the present filings for water owned by the City.

S. The instream flow, which will enhance approximately 2.9 miles of stream, will be monitored by the Colorado Division of Water Resources. A viable trout fishery should recover and be supported by this release. Approximately 2 miles of stream would be available to the public.

T. The 763.1 AF referred to as conditional decrees are not owned by the City or Mt. Werner.

U. The rights owned by Mt. Werner on Walton and Burgess Creeks cannot be used either because they are junior and do not fill during the low flow months or because they are not physically available at the filtration plant.

16-V TABLE 3-7 - This appears to be analysis of the treated water. The values for the untreated Fish Creek water need to be presented so that the comparison between Fish Creek water and Yampa River water can be made. The instream water quality for both Fish Creek and the Yampa River should be presented as means and ranges (include the number of samples) for the available data rather than data from a single sample.

PAGE 3-33 The infiltration gallery water quality discussion indicates that elevated iron and manganese concentrations may have caused problems with area swimming pool operation. As this seems to be one of the major reasons for the Forest Service not selecting this alternative water supply to meet the projected demand, additional analysis of the actual problem is necessary.

16-W The values presented in Table 3-8 appear to be from a single sample date and indicate a very large range of variability. What is the concentration of the parameters of concern during the months when the wells would be used to supplement Fish Creek water? What is the concentration of iron and manganese in Fish Creek water? What is the opportunity to dilute the infiltration gallery water with Fish Creek water?

The discussion also indicates that additional treatment would resolve this suspected problem. What would be the cost of such treatment? How does this treatment cost, which would only be necessary during a few months of a dry year, compare to the costs of building the reservoir and treating that water supply?

Other uses of this water, which would be compatible with the existing water quality, should also be examined. Can the water be used in areas of the City without swimming pools. Can the water be used for irrigation, golf courses, etc?

16-X FIGURE 3.10 - Is there a figure 3.10a as indicated on figure 3.10?

16-Y PAGE 3-30 - Is the water quality currently meeting standards as required by the management prescription?

16-Z PAGE 3-34 - While EPA recognizes that various measurements of water are presented in different units depending on who is providing, or using, the data, it would be useful if all the water quantity discussion used the same unit of measurement (e.g. AF or MG).

16-AA It would also be useful if the Forest Service, as lead agency, provided rationale for what is considered the most reasonable population estimate from the range of estimates provided.

16-BB TABLE 3-11 - What annual growth rate was used to arrive at the values for the Catamount population projections?

16-CC PAGE 3-42 - The analysis of future water demand appears to be a worse case analysis, or how much water would be needed during a reasonable projection of a worse case drought. While EPA agrees with approach there is not enough information presented to determine how reasonable the demand projection is. In other

V. Data presented in Table 3-7 is finished water data, collected by Mt. Werner to insure compliance with recent requirements of the Safe Drinking Water Act (SDWA). While required analyses have been conducted over the past several years, insufficient data is available for statistical analyses. (It is inappropriate to present maximum, minimum, and mean for three data sets; therefore, Table 3-7 presents all data for the specific sampling event). Tables 3-7 and 3-8 are intended to give an indication of water quality characteristics for both the Fish Creek Filtration Plant and the infiltration galleries during the most recent sampling efforts. All available finished water data is presented in Appendix C (Fish Creek Filtration Plant) and Appendix E (Infiltration Galleries) of the Water Resources Baseline Technical Report. Raw water data is available for Fish Creek through the USGS (site 092389000). This data substantiates the qualitative discussion of water quality presented in Section 3.3.4.1. Since the infiltration gallery water is alluvial groundwater, Yampa River water quality data is not considered necessary for this project. A further discussion of raw water quality is presented under 16.KK.

W. Further information on the infiltration galleries can be found in "Infiltration Gallery and Yampa River Pump Station Improvements Submittals", CDC, 1991 which is included in the administrative record. Additional analyses were conducted by CDC to confirm the iron and manganese problem evident in the infiltration galleries. Please also see the response under 7F.

X. Yes. Figure 3-10A is on page 3-37 of the DEIS.

Y. The Management Prescription does not have established water quality criteria. State water quality standards are presented in Table 3-6 of the DEIS.

Z. Please see response under 10D.

AA. The Forest Service has selected the moderate (3.2%) growth rate for the analysis and has extended these projections to encompass a 40-year planning horizon. This modification to the DEIS can be found in Sections 3.3.6 and 3.3.7 of the FEIS.

BB. Table 3-11 does not represent Catamount population projections. Rather, under the high growth scenario, water demand projections for Steamboat Springs (including West Steamboat) are presented, assuming that the development of Catamount would also result in spinoff population increases in Steamboat itself. An average growth rate of approximately 4.5% per year for the next 20 years was used under the high growth scenario.

CC. Please see response under 16B.

words, how often is it expected that the existing water supply would not be enough to meet the projected demand and how much water would be needed during these periods of demand. Based on EPA's review of the Water Resources Baseline Technical Report for the Fish Creek Reservoir Expansion (in particular Table 2 of Appendix G), it appears that the applicant can meet all of its worse case water demand during all but three years of the 58 year period of record, without the need to construct the proposed project. During the remainder of the period of record there would be no need for additional storage. The analysis also appears to indicate that only in very few years would the existing reservoir ever need to be utilized.

TABLE 3-15 - This table points out the efficiency which could be obtained through joint operation of the two systems. EPA strongly supports joint system operation for improved efficiency. This is an example of how a project, and the associated impacts, could be avoided either temporarily or permanently just by a different use of the same water. This table also points out the relatively small amount of yield (752 AF) necessary to meet what appears to be worse case population/ demand projections and lack of cooperation between the two districts. Given the worse case assumptions which were factored into the demand analysis:

16-DD

dry year demand
25% operational flexibility,
10% distribution losses,
200 AF instream flow,
4.82% overall population growth rate for permanent residents,
no conservation savings from installed conservation methods:
- meters and rate structures,
- new distribution lines to reduce leakage,
- voluntary watering restrictions,
- xeriscape grant,
- plumbing retrofit grant,
- pressure reduction valves, and

no use of infiltration galleries;

it is likely that the City and Mt. Werner can meet all their 2010 needs, except in the three drought years of the period of record. There would be no need to rely on the installed conservation measures, and no need to change current consumption patterns, except during the drought years. In drought years, any portion of the above conservative assumptions could be modified (i.e. use the new infiltration galleries), or the proven water conservation measures could be relied on. This raises a very basic and critical question on the fundamental need for the project.

DD. Please see response under 16B.

16-EE PAGE 3-50 - A declining block rate structure does not appear to be very aggressive conservation. What percentage of City use is commercial?

EE. The City adopted a single commercial rate structure of $1.75/1000 gallons in April 1993. This updated information is presented in Appendix H of the FEIS. Approximately 30% of the City use is commercial.

16-FF How old is the existing distribution system? The Water Resources Baseline Technical Report (AZC 1992 page 52) indicates that 25% of the existing demand is lost from leakage within the existing distribution system. If leakage is reduced to 20%, a savings of about 308 AF would be achieved under the worse case demand projection (6,160 AF, Table 3-11). This is the about the same as the total consumptive use (308 AF) which would be consumed under the worse case demand projection.

FF. Sections of the City system are approximately 75 years old. A 25% leakage rate is typical for systems with older water mains which operate under high pressure, due to the mountainous terrain. The City presently budgets approximately $200,000 per year to replace aging and leaking mains.

16-GG Is treated water used for snow making anywhere in the City/Mt. Werner system? If so, Yampa River water should also be pursued to reduce this demand.

GG. No, treated water is not used for snow-making. Both the City and the Steamboat Ski area use Yampa River water for snowmaking.

16-HH PAGE 3-57 - Future growth is projected to be dependant on future planning decisions and a sound growth management plan. Therefore the decision to build a reservoir should be delayed until these decisions have been made. Existing sources appear to be able to supply the applicants for at least 10 years while these decisions are made.

HH. Given Mt. Werner's present need for storage (see DEIS and FEIS Section 3.3.7) and the favorable interest rates, the City and Mt. Werner have decided to pursue expansion now. Please also see the revised purpose and need (Section 1.2 of the FEIS.)

16-II Why is the worse case 2010 population for the Steamboat Springs area nearly 50% greater in the DEIS (Table 3-17) than that projected as worse case in the Lake Catamount Resort FEIS (Table 4.35)? What rationale was used to project this major change?

II. Section 3.3.7 of the DEIS has been revised and a 3.2% growth rate has been selected by the Forest Service for the analysis. Additionally, projections have been extended to encompass a 40-year planning horizon.

16-JJ PAGE 4-7 - What agency would require a conservation pool under the No Action Alternative?

JJ. Under the No Action Alternative, no agency would require a conservation pool.

16-KK The water quality analysis does not analyze the impacts of the proposed project on the water quality of Fish Creek or the Yampa River. This is a major flaw in the NEPA analysis which needs to be corrected to provide both the Forest Service and other decision makers the necessary information to make informed decisions. At a minimum the pre and post project water quality of the Reservoir and Fish Creek for the various alternatives needs to be addressed. What is the potential for the bottom releases from the reservoir to become anoxic?

KK. The proposed project is not expected to result in any long-term impacts to the water quality of Fish Creek or of the Yampa River (approximately 8 miles downstream). A qualitative discussion of potential water quality impacts of the proposed project are presented on page 4-9. Given the bedrock nature of the basin and the reservoir site; the lack of vegetation in the area to be inundated; the snowmelt characteristics of the water supply; the continued release of water from the reservoir; and the ability to release water from several depths, anoxic conditions are not expected.

16-LL PAGE 4-8 - What would be the impact of the spring peak flows during the second construction season? What will happen if the second construction season is a wet year?

LL. During the second construction season, spring flow would be diverted through the main dam and through the main stem of the Middle Fork of Fish Creek. In the event of a wet year, some flow would be diverted through the Puppy Dog Lake drainage. With the reservoir drained, however, it is anticipated that this flow would be well below the peak flow of 195 cfs experienced in this channel in June 1991.

16-MM What will be the post project frequency of high flows down Puppy Dog Lake drainage? Will the proposed discharge regime result in a significant enough reduction in peak discharges on a frequent enough basis to result in restoration of the Puppy Dog Lake drainage?

MM. Flows through the Puppy Dog Lake Drainage would be kept below 20 cfs, which is expected to result in restoration of the channel. Progress, however, would be monitored by the Forest Service, and some additional manual restoration may be required. This is a significant reduction over the peak flow of 195 cfs experienced through this channel.

16-NN PAGE 4-9 - What is the surface acreage/depth of the 1,100 AF conservation pool? Would it maintain a fishery over the winter which exceeds the quality of the existing fishery?

16-OO PAGE 4-11 - The mitigation section indicates that mitigation of the erosional damage in the Puppy Dog Lake drainage is "suggested" for all three alternatives. What will be "required"?

16-PP PAGE 4-12 - What are the "engineering constraints" to installing either an early warning or remote operation system to the existing reservoir?

16-QQ PAGE 4-14 - Why is <u>future</u> planning and conservation considered "mitigation"? Mitigation is usually considered as a way to reduce or compensate for the impacts of a project which have occurred. How would future planning, which would reduce the need for a project, mitigate the impacts of a project which have already occurred. EPA has a major concern with this approach.

16-RR Pages 1-7 thru 1-9 list various other actions which probably need to be completed before construction could occur. Does the Forest Service plan on withholding its permit decision until all other decisions are made? EPA believes it would be appropriate that all agencies with permitting authorities coordinate their decision making so that the decision of one agency does not adversely affect or unnecessarily influence the decisions of other agencies. It appears that the Forest Service has made a good effort to assure that all the decision makers are aware of the issues. It would be unfortunate if this coordination effort is eliminated during the important final stages of decision making.

16-SS PAGE 4-16 - There should be power line construction methods which do not result in permanent wetland destruction. Would the power line be buried in a road as indicated on page 2-20?

16-TT What values in Table 4-2 where summed to arrive at 15.9 acres of total impact?

16-UU What information would be needed to reasonably estimate the potential wetland impacts associated with reduced flows through the Puppy Dog Lake drainage?

NN. The surface acreage/depth ratio of the 1,030 AF pool is 65 acres/23 feet. It is anticipated that a 1,030 AF conservation pool would maintain a year-round fishery, which exceeds the quality of the existing fishery.

OO. Mitigation under Alternatives B and C would include the construction of a new outlet structure, and possibly, manual restoration. Mitigation under Alternative A will be determined by the Forest Service under the terms of the existing Special Use Permit. It could include manual restoration and draining the reservoir through the fall and winter. This would allow the reservoir to capture more water, and thus prevent excess spring runoff from draining over the spillway and through the Puppy Dog Lake drainage channel.

PP. Engineering constraints include modifications to the existing dam structure (such as penetrating the existing dam and adding a new outlet pipe) which could potentially impact the structural integrity of dam. Economic constraints are discussed in response 16A.

QQ. The Forest Service recognizes that planning must be an ongoing process, especially in a community such as Steamboat Springs, which is continuously impacted by tourism and development pressures. The Forest Service believes that continued planning efforts on the part of the City will serve to maximize conservation efforts, insure the efficiency of the existing water facilities, and define future needs within the service area.

RR. The Forest Service concurs with EPA's approach of including all local, state, and federal agencies in this NEPA process. Inter-agency meetings will continue throughout the completion of the EIS and the issuance of the Record of Decision.

SS. The power line will be buried in the road until it reaches the immediate vicinity of the reservoir. At that point, it will cross the campground area and proceed along the northern edge of the reservoir, as shown in Figure 2-5. Wetlands loss due to placement of the power line are expected to be negligible.

TT. To arrive at 15.09 acres, the acreage inundated under the preferred Alternative was added to the acreage filled by the powerline.

UU. The information required would consist of additional long-term hydrologic and wetlands mapping data. The data necessary to aid in this analysis is not presently available. Overall, such an assessment would be a "best guess" estimate unless a long-term wetland data collection and analysis program was implemented. Additionally, it is the desire of the Forest Service to repair the erosional damage to the channel that has been occurring over the years since the construction of saddle dam and to return the hydrology to pre-dam conditions to the extent possible.

16-VV

PAGE 4-17 - What evidence does the Forest Service have which suggests that wetlands around a annually fluctuating reservoir are supported solely by reservoir water? EPA staff have examined many western reservoirs and have seen little evidence of fringe wetlands which could be supported solely by reservoir water. Usually the fringe wetlands are remnants of wetlands which were inundated and are still supported by side-slope drainage. This is often evident in wet years when the reservoir is down and there is still seepage into the reservoir from the fringe wetland.

16-WW

EPA recommends that the Forest Service select road corridor option 1. This is an area of the DEIS where the Forest Service should have stated a preferred option, and provided the rationale for that option, so the reader would have had a reasonable point of view to comment on.

16-XX

Does the reference to no net wetland impact resulting from selection of the borrow areas mean no change in total project impact?

16-YY

Cumulative impacts to the wetland resources of the project area should at least address the inundation impacts of existing reservoirs, stream degradation and associated riparian losses, and grazing induced habitat degradation.

VV. There is no direct evidence that wetlands surrounding this annually fluctuating reservoir are supported solely by reservoir water. That is not the intent of the comment on page 4-17. The majority of wetlands observed surrounding Fish Creek Reservoir are indeed supported by side-slope drainage. It did appear, however, that some minor wetlands had developed from, or were now supported by reservoir water. It seemed appropriate to comment on this potential for natural wetlands formation, but modify it with the sentence "The potential for this to occur and the characteristics those wetlands would assume, cannot be accurately quantified at this point in time".

WW. Road Corridor Option 1 is also preferred by the Forest Service since it would result in less impacts to wetlands and is visually more acceptable

XX. Yes. Since borrow area A-1 is defined by the limits of reservoir inundation, there would be no change in project impact due to the borrow area selection.

YY. Thank you for your comment.

16-ZZ

PAGE 4-18 - The mitigation summary does not appear to address the potential for mitigation success. Does the Forest Service have any examples (positive or negative) of wetland creation on this scale for the wetland types which would be lost? Are the wetland types which would be lost rare or unique in the project area? Do any of the wetlands to be lost have peat soils which have developed over a long period of time? These types of soils, hydrologic regimes, and associated vegetative and biological communities, are difficult, if not impossible, to recreate. The discussion of lack of reclamation success at borrow areas (page 4-26 & 4-30) lends little credence to the implied conclusion in the wetland section that it will be easy to recreate wetlands.

ZZ. There is no indication that the wetland types which would be affected are rare or unique within the area surveyed or the immediately surrounding acreage. The wetlands types mapped in the area surrounding the reservoir occur upslope in areas which will not be affected. This is particularly true of the wetlands associated with Granite and Fish Creeks and the meadow wetlands described in the DEIS. These types of wetlands are not unique within the Routt National Forest, and for this reason, the Forest Service is investigating other alternative, off-site mitigation. Please see response under 16C.

Some wetlands occupying low-lying topographies adjacent to Fish Creek Reservoir exhibit shallow to moderately deep organic layers over alluvium (see wetland sample point F-9 in the baseline report). These layers have been identified primarily as Oe and Oa horizons which have formed histic epipedons and consist of sedge and grass roots in varying stages of decay. These soils could be considered "peaty mucks" or "mucky peats", depending upon site conditions. These soils are scheduled for salvage and use in the mitigation program to help recreate wetlands.

The mitigation plan describes several instances of successful artificial wetlands creation, on a small scale, associated with the construction of roads in the area surrounding Fish Creek Reservoir. The method of creation, essentially by detaining water for a period of time behind a berm or road embankment, parallels the basic method proposed by the proponent for creating at least a portion of the wetland acreage required for mitigation. One other example of wetlands creation in a mountain ecosystem is worth noting. Wetlands on a comparatively large scale were successfully created along the borders of the Blue River near Breckenridge, Colorado. The area within which wetlands were eventually created consisted of coarse dredge mine spoil located adjacent to the Blue River. The river, prior to mitigation, did not function fully as a river system, but ran intermittently throughout its course. Following extensive engineering and construction work, the river system was partially restored. Specially prepared sites were resoiled, planted with wetlands species, and naturally irrigated/flooded. The result was the successful creation of a wetlands riverine system. The project was filmed and made into a demonstration tape entitled "The Blue River Mitigation Project: Rebuilding Our Nation's Wetlands" by the U.S. Army Corps of Engineers. There are several differences between these two mitigation projects, including water source, quality of substrate, availability of soil, etc. In many cases, though, the conditions associated with the Blue River Project would be considered more difficult to overcome than those associated with this project. The Blue River Project did show that a mitigation site properly designed and provided with a dependable water source, reasonable quality soils, and wetland planting materials can result in successful wetland mitigation.

There is a reasonable potential for wetland mitigation success given the content of the mitigation plan.

16-AAA PAGE 4-27 - Is there potential boreal toad habitat in Puppy Dog Lake drainage which would be adversely affected by the lowered water levels in the seepage areas?

16-BBB Are the impacts to wood frogs not anticipated because no potential habitat would be affected or because no frogs were found?

16-CCC PAGE 4-25 - Why is the loss of less mobile wildlife considered "minor" given that the paragraph indicates that the Forest Service has no information on the existing populations?

16-DDD PAGE 4-30 - The wildlife cumulative impact assessment, like the wetland cumulative impact assessment, does not provide the reader with any understanding of past or future impacts to the subject resources.

16-EEE PAGE 4-36 - Where would the proposed construction camp be located?

16-FFF PAGE 4-38 - The discussion of water shortages adversely affecting the City landscaping does not seem to agree with either the water supply analysis or the conservation goals presented previously. The water supply analysis indicates that the City would not have to reduce watering under the No Action Alternative. The conservation goals indicate the City will be pursuing less water demanding landscaping. This should allow the City to replace vegetative cover without affecting the visual resource.

AAA. Potential boreal toad habitat exists around the perimeter of Puppy Dog Lake where water depth is less than one foot. With reservoir expansion, water releases into Puppy Dog Lake over the spillway during spring runoff will be more uniform and less than 20 cfs. It is assumed that natural surface flow from snowmelt into the Puppy Dog Lake drainage would be sufficient to maintain existing wetland and aquatic habitat at Puppy Dog Lake. If reduced water levels in Puppy Dog Lake do occur as a result of more uniform releases over the spillway, potential boreal toad breeding habitat in the Puppy Dog Lake basin may actually be increased. Boreal toads prefer to breed in shallow water areas.

BBB. Potential impacts to wood frogs are not expected because wetland areas that would be impacted are not considered suitable habitat for wood frogs, and no wood frogs were detected by field surveys. Wood frogs prefer shallow water areas with no permanent inlet or outlet, and are rarely found in habitats occupied by trout or other amphibians (see DEIS, page 3-79). Wetland habitats which would be affected do not meet the criteria for habitat preferred by wood frogs.

CCC. Losses of less mobile wildlife, other than boreal toad, are considered minor because species potentially affected (such as small mammals, reptiles, and amphibians) are common in the region, and these species have relatively high reproductive capabilities which would eventually compensate for any direct losses. As a result, direct losses of small numbers of these types of species is not expected to result in any measurable population reductions in the project area or the region. In addition, none of the species potentially affected, other than boreal toad, are listed by the USFWS or the CDOW as threatened, endangered, or candidate species.

DDD. Wildlife cumulative impacts are expected to be minimal and are presented in Section 4.8.3.

EEE. The proposed construction camp would be located in the area to be inundated by the proposed expansion.

FFF. Thank you for your comments. During dry years, water shortages could result in visual impacts to City landscaping.

Enclosed are the more detailed comments on the DEIS. Please have your staff contact Dave Ruiter (303/293-1577) concerning the details of our comments.

Sincerely,

Max H. Dodson, Director
Water Management Division

Enclosure: Detailed Comments

cc: Corps of Engineers, Grand Junction

ROUTT COUNTY BOARD OF COUNTY COMMISSIONERS

Box 773598 • Steamboat Springs • Colorado 80477 • 303/879-0108
Fax: 303/879-3992

12 April 1993

Mr. Jerry E. Schmidt, Forest Supervisor
Routt National Forest
29587 West U.S. 40, Suite 20
Steamboat Springs, CO. 80487

Nancy Stahovlak
District 1
Oak Creek

Ben S. Baail
District 2
Hayden

L. Dennis Fisher
District 3
Steamboat Springs

Dorothy L. Mariano
Clerk of the Board
Box 773598
879-1710

Re: Comments on the Fish Creek Reservoir Expansion DEIS

Dear Mr. Schmidt:

Routt County is concerned about the impact that the referenced construction would have on the county road system. The county roads affected are Amethyst Drive, County Road 36 and County Road 38 (aka Buffalo Pass Road).

The proposed primary route would be over Amethyst Drive to County Road 36, and then to County Road 38. Amethyst Drive is showing signs of distress, as indicated by areas of "alligatored" pavement, which may need some repairs prior to or during the mobilization of construction equipment, but it is not in as poor a condition as is County Road 36 between Amethyst Drive and County Road 38. This section of County Road 36 will require extensive repairs before the construction project begins.

17-A

At the 5 April 93 meeting with the Board of County Commissioners, the City of Steamboat Springs (represented by City Engineer Dan Birch) and the Mount Werner Water District (represented by John Fetcher, Secretary) discussed the impacts of the construction project.

There was a consensus, that after Routt County did the necessary repairs to bring the affected roads to a normal condition, the City and District would assume responsibility for the maintenance and repairs of any damages that might be attributed to construction traffic.

A. Thank you for your comments. The memorandum of Understanding between the City, Mt. Werner, and County is included in Appendix K of the FEIS.

17-A cont.

In addition to automobile traffic, County Road 38 has a lot of recreational bicycle traffic during the summer months. With construction traffic added to this road, there is not only an increase in the probability of automobile/bicycle accident, but there will be an increase in dust and washboarding on the gravel segment. If this gravel is not stabilized, the road will probably have to be watered and bladed on a daily basis. This would also be the responsibility of the City and District.

Routt County and the City are developing a Memorandum of Understanding to outline the responsibilities to the road maintenance issues. Upon execution of this agreement, a copy will be sent to you.

Sincerely

Routt County Board of Commissioners

L. Dennis Fisher, Chairman

cc: Dan Birch
John Fetcher

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
Western Colorado Office
529 25½ Road, Suite B-113
Grand Junction, CO 81505-6199
Phone: (303) 243-2778 FAX (303) 245-6933

IN REPLY REFER TO:
ES/CO:FS:Rocky Mtn Region
MS 65412 GJ

FS: 2670

April 14, 1993

Elizabeth Estill
Regional Forester
Rocky Mountain Region
U.S. Forest Service
11177 W. 8th Avenue
Box 25127
Lakewood, CO 80225-0127

RE: Biological Assessment for Fish Creek Reservoir Expansion, Routt National Forest, Routt County, Colorado

Dear Ms. Estill:

The U.S. Fish and Wildlife Service (Service) has reviewed the Biological Assessment for the Fish Creek Reservoir Expansion Project on the Routt National Forest.

The Service concurs with the "no affect" determination for bald eagles (Haliaeetus leucocephalus).

The Service does not concur with the analysis and conclusions of the Biological Assessment regarding the four endangered Colorado River fishes and their proposed critical habitat. The Service has the following concerns:

18-A 1. The BA states that timing and quantity of water releases from the reservoir could result in relatively minor changes in downstream flow regimes which could affect the endangered Colorado River fish species. Although it is well known (and stated in the discussion in the BA) that timing and quantity of flows do have an effect on these species and also influence proposed critical habitat, no analysis of these effects is provided in the BA. Capturing of spring flows, and slow release during the summer, will exacerbate the problems already faced by these endangered species. In the BA, the effects are deemed minor, and therefore dismissable. The Service does not consider this to be an accurate analysis or conclusion.

2. The BA mentions depletion from increased evaporation. The BA also states that the project will result in decreased flow of water into the Yampa and Colorado rivers due to consumption by Steamboat Springs. The BA further states that this decrease will occur eventually anyway. No further analysis is conducted, and the BA concludes that since the depletion is minor and may occur anyway, there will be no adverse effect on the Colorado River fish or proposed critical habitat.

18-B The Fish and Wildlife Service believes that major causes for the decline of the Colorado squawfish, humpback chub, bonytail chub, and razorback sucker

A. The Biological Assessment has been revised to include flow, timing, and depletion estimates as requested from both existing (or historic conditions) of the Fish Creek Reservoir and under the worst case scenario should the project be permitted and implemented. The Revised Biological Assessment is incorporated into the FEIS as Appendix J.

18-B include the effect of impoundments and water depletion from the Colorado River and its tributaries. We believe that any action made possible by the Fish Creek Reservoir Expansion Project that causes a depletion of water from the Upper Colorado River Basin should prompt a "may affect" finding by the Forest Service for the listed fishes.

An estimate of depletion from any federally authorized project, regardless of whether the depletion may eventually occur anyway from another project, is required. The BA should therefore include a description of possible causes of depletion and an estimate of the total average annual depletion expected.

18-C Your estimate of the net average annual depletion (i.e., the amount consumptively used) should include the existing or historic condition as well as that amount associated with the expansion portion of the project.

When the Service has reviewed a completed analysis with an estimate of depletion and affects of changes in flow, the Service will to able to determine appropriate conservation measures to avoid jeopardy to the fish or adverse modification to proposed critical habitat.

If the Service can be of further assistance, please contact Lucy Jordan at the letterhead address or (303) 243-2778.

Sincerely,

Keith L. Rose
Assistant Colorado State Supervisor

cc: FWS/Ecological Svcs, Golden
FWS/Ecological Services, Salt Lake City
CDOW, Grand Junction

LJordan:fishcrkb.let:041393

B. Please note that the Biological Assessment, incorporated into the DEIS as Appendix J, on page 8 clearly has a finding of "May Affect" for downstream populations of the Colorado squawfish, humpback chub, bonytail chub, and razorback sucker. The conclusion immediately following "May Affect" that reads as "but is not likely to adversely affect" will be deleted from the revised Biological Assessment.

C. Please see comment under 18A.

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER
Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192
NW Region
711 Independent Ave.
Grand Junction, CO 81505
(303) 248-7175

REFER TO

For Wildlife-
For People

April 30, 1993

Mr. Jerry Schmidt, Forest Supervisor
Routt National Forest
29587 W. U.S. 40, Suite 20
Steamboat Springs, CO 80487

Dear Jerry:

Enclosed are our specific comments on the Fish Creek Reservoir Expansion Draft Environmental Impact Statement. In this letter I address what we think the overall effects will be on wildlife for the three alternatives.

Alternative A - No Action.
On-site Impacts: This alternative would have the least negative impact on wildlife in the immediate vicinity of Fish Creek Reservoir. Wetlands would not be inundated, forests would not be disturbed, and recreation facilities may not be re-located and enlarged or improved. Impacts associated with construction, inundation and increased recreational use would not occur. On the negative side for wildlife under this alternative, there would be no conservation pool for long-term fishery maintenance, and the degradation of the Puppy Dog Lake drainage would continue. However, inasmuch as this degradation is a result of the construction of the existing reservoir, improvement of this situation should not necessarily be contingent on enlargement of the reservoir. This should be especially true in a 10E management prescription area.

19-A

Off-site Impacts: To the extent that water supply can influence urbanization in the Steamboat Springs area, the No Action alternative would seem to have less impact on wildlife habitat. However, if water conservation measures or other actions were taken instead, that would also make more water available for more people, just as in alternatives B and C. Alternative A would have less impact because there are wildlife benefits to leaving water in streams without passing it through a municipal water system and sewer plant.

Alternative B - Proposed Action - Reservoir Expansion
On-site Impacts: There are also some potential impacts to many

DEPARTMENT OF NATURAL RESOURCES, Kenneth Salazar, Executive Director
WILDLIFE COMMISSION, William R. Hegberg, Member • Eldon W. Cooper, Member • Felix Chevez, Member • Rebecca L. Frank, Member
Louis F. Swift, Secretary • George VanDenBerg, Chairman • Arnold Salazar, Member • Thomas M. Eve, Vice Chairman

A. Thank you for your comments. They will be incorporated into the appropriate sections of the text and carried forward in the FEIS.

species that are not wetland dependent, but these are somewhat minor and not likely to cause problems for these species. The potential impacts to wetland dependent species such as chorus frogs and boreal toads could be more serious. In addition to wetlands mitigation proposed for upland areas, the potential for new wetlands to develop along a new shoreline should be more closely examined. Establishment of a conservation pool in Fish Creek Reservoir is a positive impact of this alternative.

Off-site Impacts: Establishment of an instream flow in Fish Creek between the water treatment plant and the Yampa River confluence is a positive impact; previous comments on the water supply/urbanization connection apply.

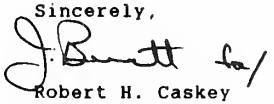
19-A cont.

Alternative C - Smaller Reservoir Expansion
On-site Impacts: Less wetlands disturbance than B; relocation and enlargement of campground would have the same potential for increased disturbance to wildlife from recreational activity as B. Less benefit from a smaller conservation pool.

Off-site Impacts: Benefits of an instream flow are less than B. Previous comments on water supply/urbanization apply.

Additional specific comments are attached. If you need clarification or have any questions on these comments, contact John Toolen of my staff.

Sincerely,



Robert H. Caskey
Regional Manager

RHC:JFT/jt

xc: Craig
Hicks
Clark
Toolen
Ellenberger
Sealing
Norris
USFWS-GJ

SPECIFIC COMMENTS
FISH CREEK RESERVOIR EXPANSION
DRAFT ENVIRONMENTAL IMPACT STATEMENT

COLORADO DIVISION OF WILDLIFE
NW REGION
APRIL 30, 1992

19-B

3.8.2 Black Bear: We would expect to find some black bear in this area even with the current level of human activity; certainly they are far more likely to occur than mountain lion.

Deer and Elk: Though pellet groups may have been encountered "relatively infrequently," this is to be expected on summer range areas and should not be interpreted to mean that these animals do not use the area.

B. Thank you for your comments. They will be incorporated into the appropriate sections of the text and carried forward in the FEIS.

19-C

3.8.7 Boreal Toads: As stated in this section, "toads are expected to be present." More definitive information on presence is needed, and the ability to mitigate habitat lost should be closely examined before choosing alternatives B or C.

C. Please see discussion under 16AAA. If boreal toads are encountered, the Forest Service and the project proponent will consult with the CDOW and Corps of Engineers regarding mitigation for relocating local populations of boreal toad habitat replacement.

19-D

3.8.8 Fish: CDOW fisheries biologists would like to visit the site this summer before making a final decision on managing the fishery in a larger reservoir. The possibility of restocking the lake with Colorado River cutthroat trout is not high, due to the likely fishing pressure at the reservoir. The instream flows and conservation pool that would be part of alternative B are positive for the recreational fishery at this reservoir.

D. Thank you for your comment. The proponent has expressed a commitment to work with the CDOW for maintaining a viable fisheries conservation pool and preserving the fishing experience at the reservoir. The Forest Service concurs.

19-E

4.5.2.2 Wetlands - Alternative B: The final sentence of this section states that the potential for wetland formation around the new shoreline cannot be accurately quantified. Couldn't a fairly good estimate be made using gradient, water depths, soils, shoreline configuration, etc., be made?

E. Thank you for your comment. Further discussion of wetlands formation is presented in the Wetlands Mitigation Plan which is included in the FEIS in Appendix K. Also, please see response under 16VV.

STATE OF COLORADO

OFFICE OF THE STATE ENGINEER
Division of Water Resources
Department of Natural Resources

1313 Sherman Street, Room 818
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June 7, 1993

Roy Romer
Governor
Ken Salazar
Executive Director
Hal D. Simpson
State Engineer

Mr. Jerry E. Schmidt, Forest Supervisor
Routt National Forest
29587 West U.S. Highway 40, Suite 20
Steamboat Springs, CO 80487

RE: **Comments on the Fish Creek Reservoir Draft Environmental Impact Statement**

Dear Mr. Schmidt:

As requested, we have reviewed the Fish Creek Reservoir Draft Environmental Impact Statement. Our comments as outlined below include dam safety issues and potential material injury to water rights.

20-A

1. According to the dam break analysis (Table 2 of Appendix F), the difference in height of the peak flood wave is an extra 8 feet from the existing peak depth of 20 feet to a 28-foot peak flood wave at the crossing of Highway 40. The proposed dam raise does not change the hazard classification status for this dam (Class 1). We recommend that the applicant install a remote control for the gate and an early warning system regardless of whether the dam is raised or not. In addition, we recommend the dam operators update and exercise their emergency action plan on an annual basis.

20-B

2. The Puppy Dog Lake drainage basin is less than one tenth of a square mile. Routing additional flow through this drainage will probably increase erosion. Therefore, we support options that would reduce the impact of routing major storm flows through the Puppy Dog Lake drainage.

20-C

3. The proposed wetlands mitigation plan suggests a replacement ratio of 1.5 acres for every 1.0 acre of wetlands lost. This would result in an increased consumptive use by phreatophytes and other naturally occurring vegetation. Please be advised that the applicant is required to provide augmentation water to compensate for stream depletions associated with the additional consumptive use of the constructed wetlands.

Thank you for giving us the opportunity to comment. If you have any questions, please contact Sally Lewis, Dam Safety Engineer, in Steamboat Springs at (303) 879-0272 or Bahman Hatami of this office.

Sincerely,

Hal D. Simpson, P.E.
State Engineer

HDS/BH:clf/fishcrk.res
cc: Sally Lewis

A. Please see response under 7B

B. Thank you for you comment. The Proposed Action would reduce flow through the Puppy dog Lake drainage basin.

C. Thank you for your comment. The City has been advised of this requirement.

APPENDIX B

ID TEAM MEETING MINUTES

1.0 INTRODUCTION

The initial Fish Creek Reservoir Expansion Environmental Impact Statement (EIS) ID Team meeting was held at the Routt National Forest Supervisor's office at 9:00 am on May 29, 1992. The following were in attendance:

Name	Organization
Wendy Schmitzer	Forest Service (FS) - ID Team Leader
Jean Ray	ACZ - Assistant Project Manager
Ken Kowynia	FS - Lands
Kirk Wolff	FS - Soils/Hydrology
Mike Retzlaff	FS - Planning/Economics
Sue Struthers	FS - Cultural Resources
Loren Labovitch	FS - Volunteer
Kim Vogel	FS - Public Affairs
Julie McQuary	FS - Visuals/Aesthetics
Neil Siettmann	FS - Engineering/Safety
Kit Buell	FS - Wildlife/Fisheries
Trish Clabaugh	FS - Social Concerns
Leo Snowden	FS - Transportation
Conrad Parrish	ACZ - Project Manager
Sherry Reed	FS - District Ranger
Dan Birch	City of Steamboat Springs
Rob Schmitzer	FS - Recreation/Wilderness
Jerry Schmidt	FS - Forest Supervisor

Rob Schmitzer and Jerry Schmidt were only able to attend the final portion of the session. The meeting agenda is attached.

Wendy Schmitzer and Conrad Parrish moderated the meeting discussions. The meeting began with the introduction of participants, a discussion of meeting objectives and the description of the roles of the key project team members. Wendy discussed the third party agreement between the Forest Service, ACZ Inc. (ACZ) and the project proponent. The Fish Creek Reservoir expansion proponent is a partnership between the City of Steamboat Springs (City) and the Mt. Werner Water and Sanitation District (Mt. Werner).

Kim Vogel expressed concern that City and ACZ representatives were present at the ID team meeting. Wendy responded that ACZ was present to assist in facilitating the meeting process. She noted that the City was present to act as a technical resource and to observe and further understand the National Environmental Policy Act (NEPA) process.

2.0 PROJECT BACKGROUND

Dan Birch presented a slide presentation summarizing the project history. The present reservoir covers 90 acres and has a capacity of 1800 acre-feet (ac-ft). The proposed expansion would inundate an additional 50 acres and provide an additional 2200 ac-ft of storage capacity. The proposed reservoir, therefore, would have a total capacity of 4000 ac-ft and cover an area of 140 acres. Dan also discussed several alternative reservoir sites considered by the City and Mt. Werner, including the Wren, Nash, and Long Lake sites.

Dan responded to several questions on water system operations and water rights. While the City maintains direct flow and storage rights, Mt. Werner has only direct flow water rights. In general, the City system operates as follows: Between April and August (approximately), the City utilizes its direct flow rights from Fish Creek. In August (approximately), the City begins releasing an additional 2 cubic feet per second (cfs) from storage (the total flow being released is approximately 6-8 cfs). Between August and October, the water level in the reservoir gradually decreases. In October, the City cuts back on released flow, and the reservoir once again begins to fill. The City maintains good flow records and has gaging stations on two influent streams, the spillway, and the outlet.

The City also maintains an infiltration gallery alluvial groundwater system. According to Dan, the alluvial wells serve two primary purposes:

- Provide water to the system during peak demands
- Provide redundancy to the water distribution system

Since there is only one line from the Fish Creek Filtration Plant into the City system, the wells provide the assurance that water can be moved into the system from an additional source. While the alluvial groundwater wells provide several benefits to the City, Dan feels that they should not be utilized as a primary water source since the water is of lesser quality than the Fish Creek supply and since the water must be pumped into the system. System operational costs could increase substantially if continued pumping is required.

Mt. Werner presently maintains direct flow rights from Fish Creek. They also supplement their supply with water from infiltration gallery wells. Presently, water taken from Fish Creek is treated at the Fish Creek Filtration Plant for both the City's and Mt. Werner's water systems. Additionally, well water for both water systems is pumped through a common pump station. With the construction of the proposed dam, the City may turn over up to 2000 ac-ft of conditional water rights to Mt. Werner.

3.0 ISSUES

After the review of the project background and the subsequent discussions pertaining to water system operations, the ID Team examined the summary of public comments. Additional issues, Forest Service management concerns, and potential connected actions were discussed. It was determined that all identified issues would have to address direct, indirect, and cumulative effects. For that reason, cumulative effects were eliminated as an issue.

After all issues had been identified and discussed, the ID Team determined whether the issues were significant or insignificant. Wendy and Conrad reviewed the definition of significance and noted that all issues would be discussed regardless of the determination of their significance status. Rather, it was noted that all significant issues must be addressed in the identification and analysis of alternatives.

Following is a brief description of the issues identified by the public and the ID Team.

3.1 Significant Issues

3.1.1 Dam Safety and Flood Hazard

- Dam safety cannot be guaranteed
- Portions of Steamboat are at risk of flooding
- Warning systems will not prevent dam failure
- There is currently the need for an evacuation plan
- Improvements in dam safety (including an early warning system) may result from dam expansion
- Area geology will impact flood boundaries
- Location of fault zone may indicate potential dam failure
- Area property and homes may be destroyed by flooding; what recourse does an individual have?
- What are the costs (monetary and non-monetary) of dam failure?
- Permit terms must be included to protect public lands and insure that the costs resulting from potential dam failure are borne by the proponent

Issue Statement: This issue addresses dam safety, including dam design and construction criteria, an early warning system, and an evacuation plan. It includes monetary and non-monetary costs associated with potential dam failure and subsequent flooding.

3.1.2 Cost

- Financing - how will the project be funded and paid for?
- Economic efficiency - what are the overall costs and benefits (on a local, regional, federal level)?
- Equity - who is paying and who is benefitting from the project?
- With low interest rates, money is cheap at this point in time
- What are the impacts to fixed-income residents?
- What are the cumulative costs through the system (including water treatment and distribution and wastewater collection and treatment)?

Issue Statement: This issue addresses the cost, financing, economic efficiency, and the equity of the proposed dam expansion. It includes cumulative costs through the system.

3.1.3 Need for the Project

- What is the City's need?
- What is Mt. Werner's need?
- What is the timing of the need?
- How does potential service area expansion correspond to the projected need?
- How does need relate to moderate income housing?
- How does the projected expansion capacity (2,200 ac-ft) correspond to the projected need?
- What percentage of this need could be offset by consolidation (jurisdictional and/or functional) of the City's and Mt. Werner's water districts?
- What percentage of this need could be offset by environmental education and conservation programs?

- Would expansion be required if the City and Mt. Werner shared resources and instituted conservation measures?

Issue Statement: This issue concerns the purpose and need for the dam expansion for the City and for Mt. Werner, considering individual and combined resources. It includes the timing of the need in light of potential consolidation of water districts and conservation programs.

3.1.4 Wetlands

- Concern exists for possible wetlands loss and the impact on threatened and endangered species
- With expansion, there exists the opportunity to enhance wetlands and wildlife habitat
- Reclamation of borrow sources must ensue if borrow sources are wetlands
- 404 and 401 permits must be obtained
- Reclamation of wetlands should address aesthetic concerns

Issue Statement: This issue considers the potential loss of wetlands and includes concerns associated with the loss of habitat, threatened and endangered species, permitting, reclamation, and aesthetics.

3.1.5 Fisheries

- Habitat improvement may not be needed
- Habitat improvement may be positive
- What is the cost resulting from the temporary loss of fisheries?
- What is the difference between the natural channel/flow regime, the existing regime, and the proposed regime?
- What are the impacts of water system operations on the fisheries?
- What are the effects of in stream flows on fisheries?
- The proposed expansion must meet all standards and guidelines for fisheries.
- Is a fishery an appropriate use for a watershed?
- How does in stream flow impact channel maintenance?

Issue Statement: This issue is directed at impacts to fisheries in terms of cost, various channel/flow regimes, water system operations, and regulations and guidelines.

3.1.6 Consequential Growth Impacts

- What is the cause and effect relationship between growth and water storage?
- Does water storage promote growth and result in changes in lifestyle and the quality of life?
- By limiting water supply, are we limiting growth and development?
- Does limiting water storage raise the cost of living?
- By limiting water supply, are we limiting low income housing within and outside of City limits?

Issue Statement: This issue addresses the consequential growth impacts of the proposed reservoir expansion and includes potential changes in area growth patterns and development and impacts to individual and community lifestyle and quality of life.

3.2 Insignificant Issues

3.2.1. Water Quantity/Quality

- What are the impacts of the proposed expansion on water rights?
- What are the direct and indirect impacts on water quality?
- What is the impact of sedimentation during construction activities on turbidity and total suspended solids?
- How does the recreational usage of the reservoir impact water quality?
- Will the expansion result in increased recreational usage and increased water quality impacts?

3.2.2 Recreation

- How will the proposed expansion impact the dispersed campground at the reservoir?
- Is camping an acceptable use at a municipal water supply?

3.2.3 Transportation

- What are the impacts to the roads from construction equipment?
- What are the long term impacts to the road system due to utilization of the area, assuming present level and increased utilization?
- Will the proponent assume a commensurate share of the costs associated with maintenance and repair of the roads?
- What is the proponents operating plan, during and after construction activities?
- Will the operating plan be incorporated into the permit?
- What mix of traffic will be utilizing the roads?

3.2.4 Wildlife

- What are the impacts to wildlife?
- Are any threatened and/or endangered species impacted?

3.2.5 Additional Forest Service Comments

- Adjust visual quality objectives (VQO) and incorporate visual mitigation into design; where possible, improve visual aspects of a project, including structures, parking areas, roads, staging areas, etc.
- If possible, use a borrow source outside of wetland areas
- Include construction safety (including fuel tank safety procedures) in the permit
- Conduct cultural surveys (level 2 surveys) on all viable alternatives
- Discuss connected actions, including the future development plans of the Buffalo Pass area

4.0 ALTERNATIVES

After the discussion of issues was completed, the ID Team identified a number of alternatives to be considered in the EIS:

- No Action
- Water Conservation
- Consolidation (jurisdictional/functional) of the City and Mt. Werner's water districts
- Expansion of well fields (City's and/or Mt. Werner's)
- Fish Creek Reservoir Expansion
- Nash Reservoir Construction
- Wren Reservoir Construction
- Long Lake Reservoir Expansion
- Construction of other (out of basin) reservoir sites (i.e. Walton Creek)
- Expansion of mainstream Yampa reservoir sites (i.e. Yamcola, Stagecoach, Catamount)
- Modified version (smaller/larger) of Fish Creek Reservoir Expansion
- Deepen Fish Creek Reservoir
- Combinations of above alternatives
- Alternative timing/phasing of facilities (or alternatives)

APPENDIX C

WATER CONSERVATION

Prepared for

United States Forest Service
Routt National Forest
29587 West U.S. 40, Suite 20
Steamboat Springs, Colorado 80487

WATER CONSERVATION

January 1993

Prepared by

ACZ Inc.
1475 Pine Grove Road, Suite 109
P.O. Box 774018
Steamboat Springs, Colorado 80477

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1.0 INTRODUCTION

In arid regions, such as the western United States, water has become an increasingly finite natural resource. Due to rapid growth and development, demand for water has steadily risen and has surpassed available supplies in some areas. Water resource management has traditionally been applied to the construction of treatment facilities and the development of water supply projects such as dams and reservoirs. However, because water resources have become scarce in many regions of the country, it has become necessary for water resource managers to develop water conservation techniques. Water conservation research has led to improvements in such water-using technologies as toilets, showerheads, irrigation equipment, and faucets. The development of more water-efficient appliances, as well as innovative management strategies, has enabled consumers to maintain the quality of their lifestyles while consuming less water. Due to these new developments, water efficiency has emerged as a viable alternative to developing new water supplies and expanding treatment facilities. The purpose of this study is to discuss some of the more efficient water-using measures that are now available and to present practical methods of promoting water conservation.

According to the United States Water Resources Council, water conservation can be defined as activities designed to (1) reduce the demand for water, (2) improve efficiency in use and reduce losses and waste of water, or (3) improve land management practices to conserve water (Maddaus, 1987). Through the installation of appropriate low flow water fixtures and by educating the public about techniques designed to reduce water use, water efficiency can be increased.

Water conservation programs can result in significant benefits to the water utility and its customers. In general, conservation measures can reduce demand or increase supply during drought years, or can extend short supplies during other emergency conditions. Water conservation can also result in:

- Energy savings
- Wastewater reductions
- Environmental protection
- Cost reductions

Reductions in water use can decrease the amount of energy used to heat water in homes and offices. Water heaters are the second largest energy users in the home, and heating water consumes the equivalent of 1.1 million barrels of oil per day nationwide. One third of our hot-water use can be reduced, however, by effective water conservation (Maddaus, 1987).

Water conservation is also a means by which costs associated with water and wastewater treatment can be lowered. Conserving water can decrease water demand and wastewater flow and thus save pumping energy and reduce chemical use involved in water and wastewater operations. Large water savings can also prevent the need to expand or build additional treatment facilities. Furthermore, as a means of protecting the environment, water use reductions may increase stream flows and water levels in existing reservoirs, and may reduce drawdown of underground aquifers (Maddaus, 1987).

Potential drawbacks that should be considered, however, prior to implementing a water conservation program include:

- Reduction of water utility revenues
- Growth inducement
- Increase in drought vulnerability due to the delay in construction of additional water supplies

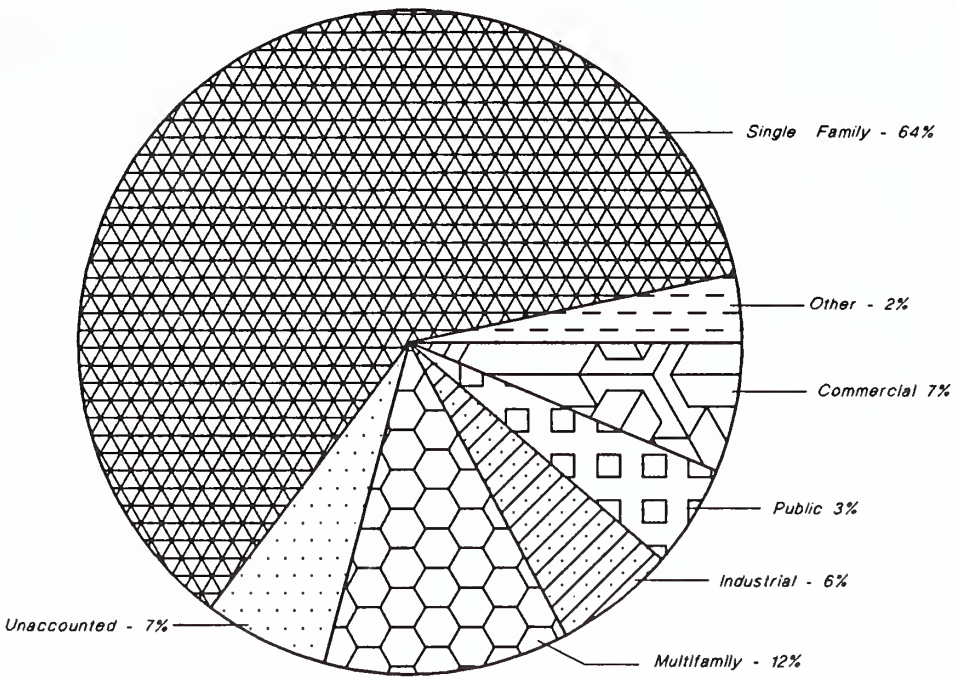
Because customers that practice water conservation and reduce their water use will have lower water bills, increased water-use efficiency can potentially reduce utility revenues. If a conservation program is cost-effective to the water utility, less revenue should be required to cover lower operating expenses. For this reason, advanced planning is necessary to determine the effect of conservation-related reductions on future demands and future revenues that will result from anticipated growth (Maddaus, 1987).

Due to demand reductions associated with water conservation programs, it is also possible that increased water efficiency will reduce the perceived need for additional water sources and thus postpone construction of additional water supply facilities. Delaying construction of new water supplies will mean that if substantial need arises in the future, the cost of supplying additional water will be higher. Furthermore, delaying the augmentation of a water utility's supply capacity may increase a community's vulnerability to drought and thus create more hardship during shortages. It will be difficult for communities that already practice methods of conservation and are without a major surplus of water to cut back on water use during times of drought. Again, this brings about the need for skillful advanced planning. In some cases, implementing conservation programs and constructing water supply projects at the same time may be the best course of action (Maddaus, 1987).

Finally, it is important to consider potential growth impacts. Water conservation can be perceived as creating additional sources of water which can be used to extend service to undeveloped areas. On the other hand, a lack of water can drive the cost of living up and potentially restrict growth in severe situations. In regions where community growth is controversial, these issues may be a problem (Maddaus, 1987).

Good planning is necessary to determine direct and indirect effects, and to weigh the costs and benefits of implementing effective water conservation. Decisions must also be made about the types of water use upon which a conservation program will focus. Figure 1, Typical Municipal Water Use, presents an average breakdown of municipal water demand nationwide and thus shows where the largest demand reductions are possible.

Presently, the issues surrounding water management are being compounded by federal and state environmental and public health regulations. Furthermore, because water, for the most part, is appropriated, the water problems of the next 100 years will likely consist of increased social and legal conflicts (Vranesh, 1989). In resolving these issues, it will be essential to promote effective water management and efficient water use through a conscious effort on the part of both the consumers and the suppliers of our nation's water resources.



TYPICAL MUNICIPAL WATER USE

SOURCE: Maddaus, 1987

Project No.: 828-1500	Design By: R. PETERSON	Scale: NO SCALE
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FIGURE 1

FISH CREEK EIS

TYPICAL WATER USE

2.0 METHODS OF CONSERVATION

Table 1, Typical Long-Term Water Conservation Measures, presents an overview of conservation practices which can be used to reduce various types of water demand. The following section of this report discusses many of these methods and presents some typical demand reductions that have been achieved using these methods. Table 2, Typical Demand Reductions, summarizes these findings. The conservation methods addressed in this report are categorized in the following manner:

- Utility-Based Programs (management-oriented practices)
- Outdoor Water Use (irrigational and landscaping needs)
- Indoor Water Use (toilets, showers, sinks, etc.)
- Other Methods of Implementing Conservation (public education, regulatory measures)

2.1 UTILITY-BASED PROGRAMS

2.1.1 Metering/Rate Structuring

Meter based billing, in which customers are billed for water service based on metered water use, provides a strong incentive for customers to use less water than they would if he billed on a flat-rate or uniform-rate basis. Declining block rates, which allow larger water users to obtain lower unit prices than smaller water users, and flat rates have been used extensively in the past. Today, however, water utilities have found that the use of meters and rate structures which encourage the wise use of water are effective means of encouraging water conservation. Typically, water prices are determined according to the revenue needed to cover costs of adequate service to a utility's customer. Figure 2, Common Rate Structures, provides a graphic illustration of different types of rate structures. Two rate structures which typically result in water savings, the inclining block and peak/seasonal demand rate structures, are discussed below.

Inclining Block Rates

An inclining block rate (also referred to as an increasing block rate) is a price structure in which the unit price of water increases with use. This type of pricing has immediate effects on water use as consumers are inclined to save water in order to save money. The increasing block structure is especially effective in the summer when water use is high and the associated marginal price would be higher. For residential customers in Denver, Colorado reductions in use have approached 10 percent using this price structure (CDM, 1992). Some utilities use billing programs which combine flat rate-service charges with an inclining block rate structure.

Peak Demand Pricing/Seasonal Demand Pricing

Both peak and seasonal demand pricing are rate structures in which water utilities charge a higher price-per-volume of water during peak demand periods. The use of this type of rate structure tends to augment water savings during times when the largest demand reductions are possible. As is typical in most areas, the peak water demand period in Steamboat Springs occurs during the summer. Peak monthly usage is generally three times that of low monthly usage in

TABLE 1

TYPICAL LONG-TERM WATER CONSERVATION MEASURES

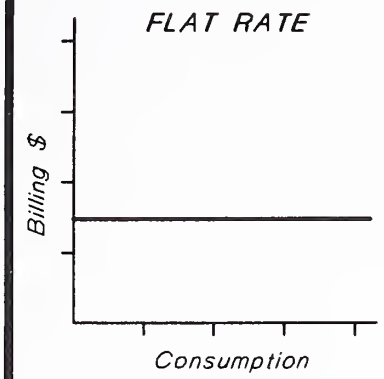
General	Public information In-school education Metering Pressure reduction Pricing Uniform commodity rates Inclining commodity rates Seasonal rates Leak detection and repair System rehabilitation
Interior residential use	Low-flow shower heads Shower-flow restrictors Toilet–tank displacement bottles/dams Pipe insulation Faucet aerators Water-efficient appliances
Devices for new construction	Low-flush toilets and ultra-low-flow toilets Low-flush shower heads Pipe insulation Faucet aerators Water-efficient appliances
Power generation	*Recirculation of cooling water Reuse of treated wastewater *In-system treatment
Industrial use	*Recirculation of cooling water *Reuse of cooling and process water Reuse of treated waste water Efficient Landscape irrigation Low-Water-using fixtures *Process modification
Agricultural irrigation	Off-farm conveyance systems *Canal lining, canal realignment, canal consolidation *Phreatophyte control On-farm distribution and irrigation systems *Ditch lining or piping *Water-control structures *Land leveling or contouring Sprinkler irrigation Drip irrigation Subsurface irrigation *Tailwater irrigation Irrigation scheduling *Improved tillage practices Surface mulches Pressure regulator
Landscape irrigation	Efficient landscape design Low-water-use plant material Scheduled irrigation Efficient irrigation systems Tensiometers

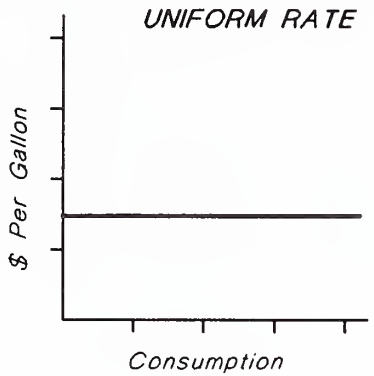
*These conservation practices are not discussed in detail in this report.

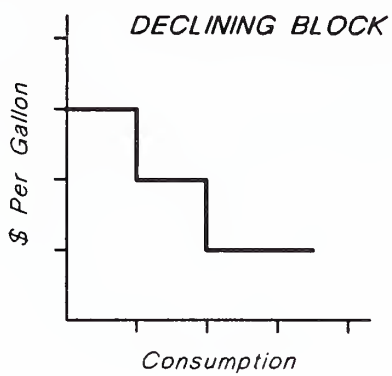
TABLE 2

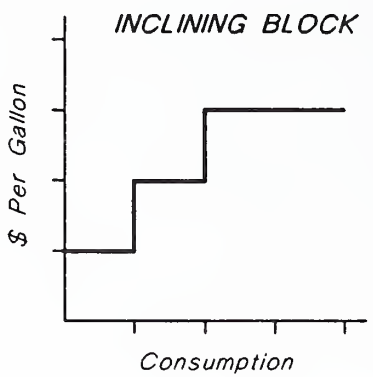
TYPICAL DEMAND REDUCTIONS

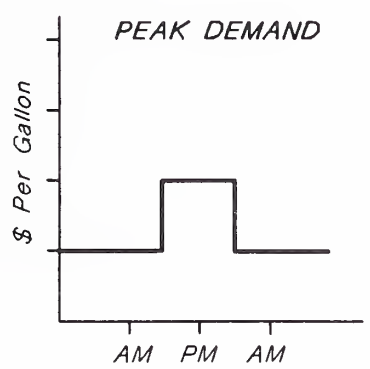
Conservation Practices	Typical Reductions
Inclining Block Rates	10% of Residential Water Use
Peak/Seasonal Demand Pricing	6-83% of Peak Demand 3-10% of Total Demand
Pressure Reducing Valves (PRV's)	10% of Total Supply
General Outdoor Conservation	40-54% of Outdoor Use
Ultra Low Flow Toilets	57-78% of "Toilet Demand"
Low Flow Showerheads	34-50% of "Shower Demand"
Faucet Aerators	Up to 48% of "Faucet Demand"
Retrofit Kits sent to homes (toilet tank bag, leak detector, dye tablets, shower flow restrictors, rain gauges)	Up to 6% of Indoor Use
Public Education	8% of Total Water Use

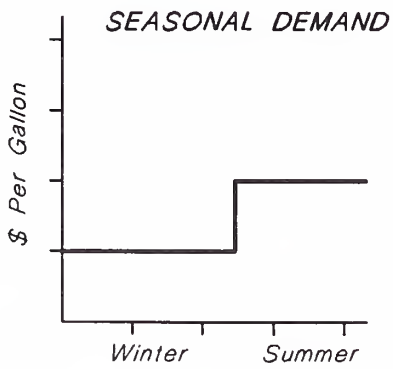


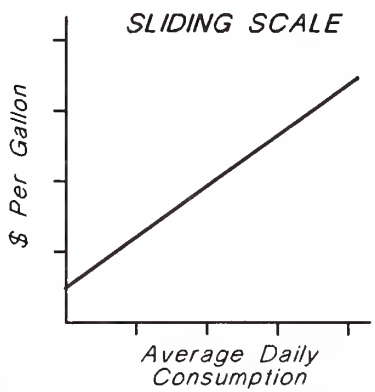


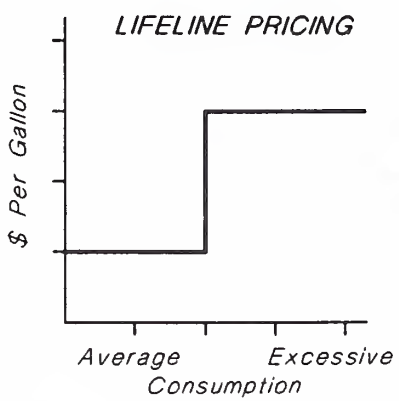












SOURCE: U.S.G.S. 1992

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FIGURE 2

FISH CREEK EIS

COMMON RATE STRUCTURES

Steamboat (ACZ, 1992). Because increased water demand during the summer is generally driven by landscaping and general irrigation needs (especially in arid regions such as Colorado), peak demand and/or seasonal demand rates often result in lower water usage for landscaping. Through peak demand pricing, reductions of 6 to 83 percent in peak demand and 3 to 10 percent in total demand have been reported (CDM, 1992).

2.1.2 Pressure Reduction/Leak Detection Programs

Pressure reducing valves (PRVs) are frequently installed on water mains or laterals in order to regulate flow pressure. For maximum efficiency, flow pressure should be between 50 and 60 pounds per square inch (psi) (RMI, 1991). Installing PRVs during the construction of new water systems is always the least costly way to regulate water pressure. Generally, installing PRVs in existing lines provides insignificant gains, but in large areas where pressure exceeds 60 to 80 psi, retrofitting with PRVs on some main lines may be cost effective (RMI, 1991). Maintaining efficient flow pressures within a water system can provide immediate and long-term benefits to both the community and individual consumers and is especially important to the success of low flow plumbing fixtures. Pressure reduction programs implemented by the Denver Water Department have resulted in savings of up to 10 percent (CDM, 1992).

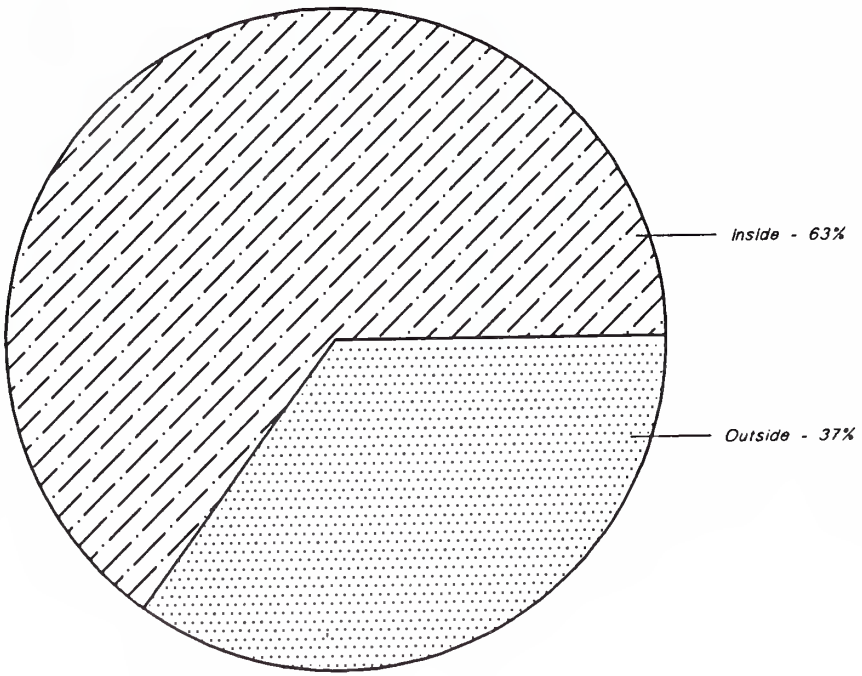
The detection and repair of leaks in utility water distribution systems can also result in significant water savings. Unaccounted for water use has been reported to be as high as 25 to 35 percent (Conserv, 1990), but it is generally estimated in the range of 8 to 15 percent of the total water supplied to a system (CDM, 1992). In Boston, Massachusetts leak detection programs reduced the amount of water lost in the system from a high of 50 percent in 1976 to 36 percent in 1982 (Maddaus, 1987). More recently, the City of Glenwood Springs, Colorado has conducted a leak detection survey which resulted in savings of approximately 331,000 gallons of water per day (ACZ, 1992).

2.2 OUTDOOR WATER USE

As shown in Figure 3, Residential Water Use, nearly 40 percent of residential water demand is comprised of outdoor water use. However, during the summer, outdoor water use in arid and semi-arid regions can comprise over 70 percent of a household's water needs (Danielson, Feldhake, and Hart, 1981). Because of the addition of outdoor water needs, annual water demands typically peak during the summer. For this reason, conservation programs often focus on the summer season and target outdoor water use such as watering lawns, washing cars, and irrigating crops.

The majority of outdoor water usage is due to agricultural and landscaping needs. Because a large portion of the water used for irrigation (whether it be for agriculture or for landscaping) is lost to evapotranspiration and is not returned to the watershed, it is important to irrigate efficiently in order to reduce water waste. Efficient irrigation techniques can be promoted through public education, rate structuring, incentive programs, and in some cases regulatory measures. Through implementation of outdoor conservation programs, savings of 40 to 54 percent on individual lots have been reported (CDM, 1992). Today, the most efficient methods of horticultural-based conservation include:

- Evapotranspiration programs
- Drip or trickle irrigation
- Automated watering



Residential Water Use

SOURCE: Maddaus, 1987

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FIGURE 3

FISH CREEK EIS

TYPICAL WATER USE

- Soil moisture monitors
- Cycle irrigation
- Xeriscaping

2.2.1 Evapotranspiration Programs

Evapotranspiration (ET) is the amount of water lost to evaporation and transpiration (water consumption) by plants. Based on temperature, precipitation, solar radiation, humidity, and plant or turf (lawn) type, an ET value can be estimated that quantifies the exact amount of water needed to maintain healthy vegetation. ET ratings inform consumers of how much water they need to apply to their lawns, thereby minimizing water waste. In conjunction with ET ratings, consumers are typically restricted to watering on specified days, which also tends to decrease water use.

2.2.2 Drip or Trickle Irrigation

Due to low evaporation rates and direct application, drip irrigation and subsurface trickle irrigation for non-turf (lawn) areas are two very efficient methods of applying water to agricultural crops and to residential, commercial, or industrial landscapes. Both of these methods have proven to be as effective as using sprinklers but a great deal more efficient. Deep drip irrigation can also reduce weeding requirements by making it more difficult for weeds to sprout in surface soil. It can also flush salts below the root zone increasing the quality of the near surface soils.

2.2.3 Automated Watering

A timed sprinkler system can increase efficiency by monitoring how long and at what time water is applied to a lawn. By shifting lawn watering patterns to the evenings or early mornings when evaporation rates are lower, less water is required.

2.2.4 Soil Moisture Monitors

Buried electronic sensors, such as gypsum block tensiometers, are able to monitor soil moisture and determine when the soil is dry and needs watering. The buried block absorbs and loses moisture at approximately the same rate as the surrounding soil, and can thus advise consumers of how much water is needed to keep the soil moist. These monitors can be used in conjunction with drip or trickle irrigation or automated watering systems to increase efficiency even more. The use of soil moisture monitors has reportedly resulted in up to 50 percent reductions in irrigational water use (RMI, 1991).

2.2.5 Cycle Irrigation

The concept of cycle irrigation involves the application of water in cycles according to the time it takes for significant runoff to occur. The purpose of applying water in cycles is to reduce runoff (essentially wasted water) by allowing each cycle of water to be absorbed into the soil before applying the next allotment. By reducing runoff, water waste is held to a minimum and watering becomes more efficient. This method of conservation is especially effective on small turf areas found in typical single family homes.

2.2.6 Xeriscaping

Xeriscaping may be the most effective method of reducing irrigation water demand. Essentially, xeriscaping entails landscaping with indigenous, low-water demand plants. These types of plants are referred to as xerophytes. In this manner, landscaping can provide functional and aesthetic value without requiring large quantities of water. In general, the fundamentals of xeriscaping include:

- Limiting turf (lawn) areas which generally require large quantities of water
- Irrigating efficiently (using methods such as those aforementioned)
- Improving the soil for better absorption of water and improved water-holding capacity
- Using mulches in planting beds to minimize evaporation, reduce weed growth, and slow erosion
- Using native, lower water demanding plants and turfs (xerophytes)
- Performing appropriate maintenance frequently

Even in the absence of turf reductions, the implementation of xeriscaping techniques has resulted in an average savings of 23 percent of a consumer's outdoor water use (Maddaus, 1987). However, studies that have been done on xeriscaping have shown that landscapes with half as much turf as traditional yards require 54 percent less water, 25 percent less labor, 61 percent less fertilizer, 22 percent less herbicide, and 44 percent less fuel to maintain (RMI, 1991).

Xeriscaping is also being recognized as an umbrella concept that can provide solutions to other resource management problems. Besides reducing demand on water supplies, xeriscaping can also:

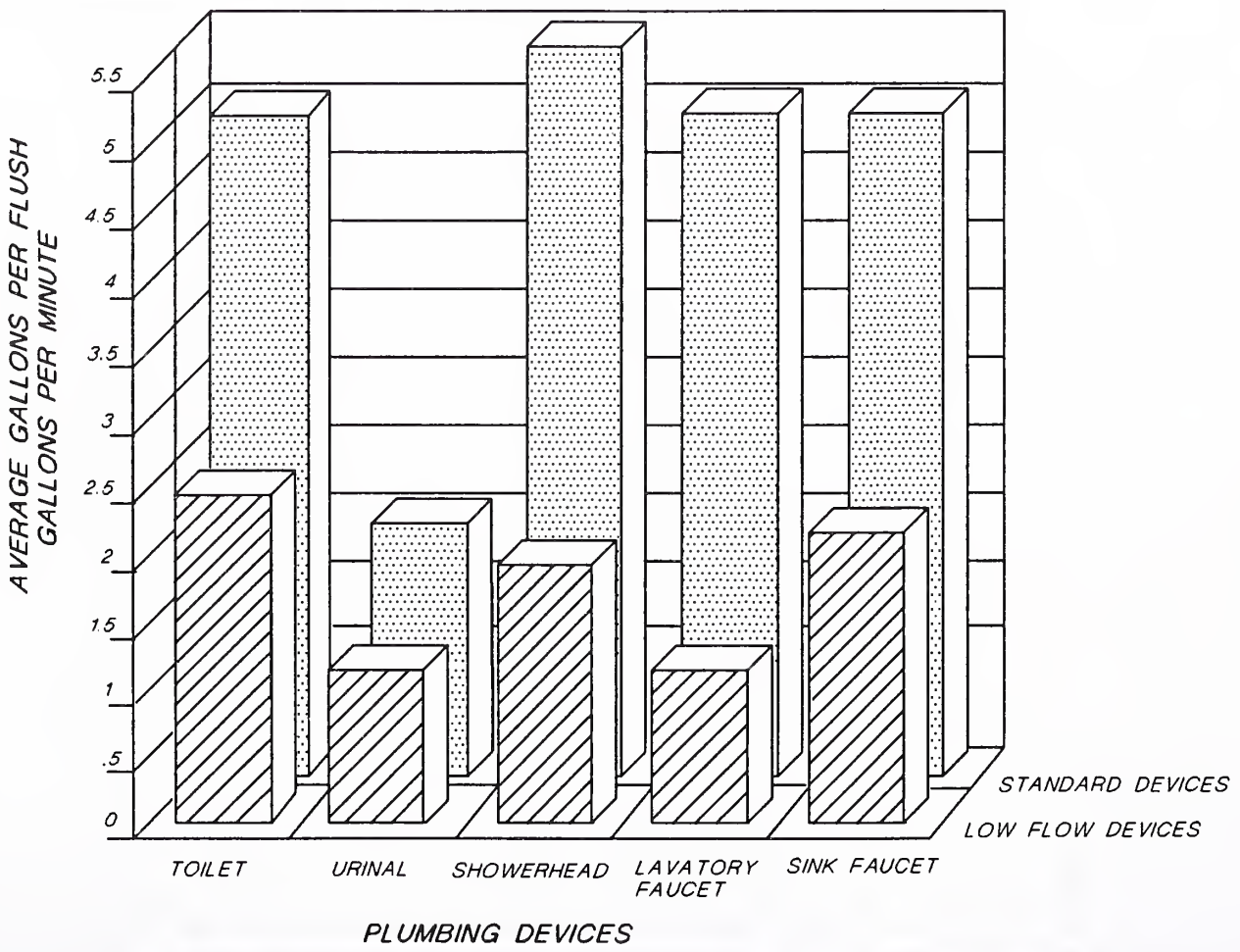
- Preserve and enhance water quality by reducing non-point source water pollution (less fertilizer)
- Reduce demands for non-renewable energy resources (lowers energy consumption of water and wastewater treatment facilities)
- Reduce solid waste disposal (no grass clippings)
- Beautify sometimes harsh urban environments (using native plants)
- Preserve local biological diversity

Non-point source pollution occurs from surface water discharges and accounts for approximately 80 percent of the nitrogen and 50 percent of the phosphorous contamination of the nation's rivers and streams (Conserv, 1990). Reducing fertilizer applications for native landscapes will decrease this type of pollution.

2.3 INDOOR WATER USE

2.3.1 Low Flow Devices

The installation of low flow faucets has long been recognized as a quick and simple way to reduce water demand. The utilization of these products is achieved through building ordinances that require the installation of low flow plumbing devices and through retrofit programs that replace traditional plumbing devices with low flow devices. Figure 4, Comparison of Standard and Low Flow Plumbing Devices shows the contrast between average flow rates of standard and



Based on 60 PSI
Source: RMI, 1991

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FIGURE 4

FISH CREEK EIS

COMPARISON OF STANDARD AND LOW FLOW PLUMBING DEVICES

low flow fixtures. Low flow fixtures generally use about half of the water that traditional devices use.

Plumbing fixtures which contribute to residential indoor water demand are shown in Figure 5, Residential Indoor Water Use. As the figure shows, almost 90 percent of water consumption in common households is associated with flushing the toilet, taking a shower, washing clothes, or running the sink. With low flow devices, it is possible to reduce the flow rates of all four of these items.

Toilets

Traditional toilets use between 5 and 7 gallons of water per flush (gpf). Low flow and ultra low flow toilets, however, use only 3.5 and 1.6 gpf respectively (RMI, 1991). Low flow toilets are currently being manufactured and used all over the world including Mexico, South America, Asia, Europe, Australia, Indonesia, Sweden, and the United States (Conserv, 1990). Replacing a conventional toilet with an ultra low flow toilet can reportedly result in savings of 57 to 78 percent in this category of plumbing fixtures (RMI, 1991).

Another method of reducing a toilet's flow rate is the use of damming or displacement devices. Volume displacements with bottles or bricks, or tank displacement kits, are an inexpensive means of reducing water use in toilets without replacement costs. There are, however, several drawbacks with using these devices. Some devices do not fit properly in all toilet models and some may reduce toilet flush performance. Furthermore, the savings that have been reported with use of toilet dams is relatively low (less than 10 percent) compared to what can be saved with a toilet replacement (RMI, 1991). Dual flush systems, a retrofit device which allows users to vary the flush volume of a toilet, may be the most effective yet inexpensive method of retrofitting high-water demand toilets.

Showerheads

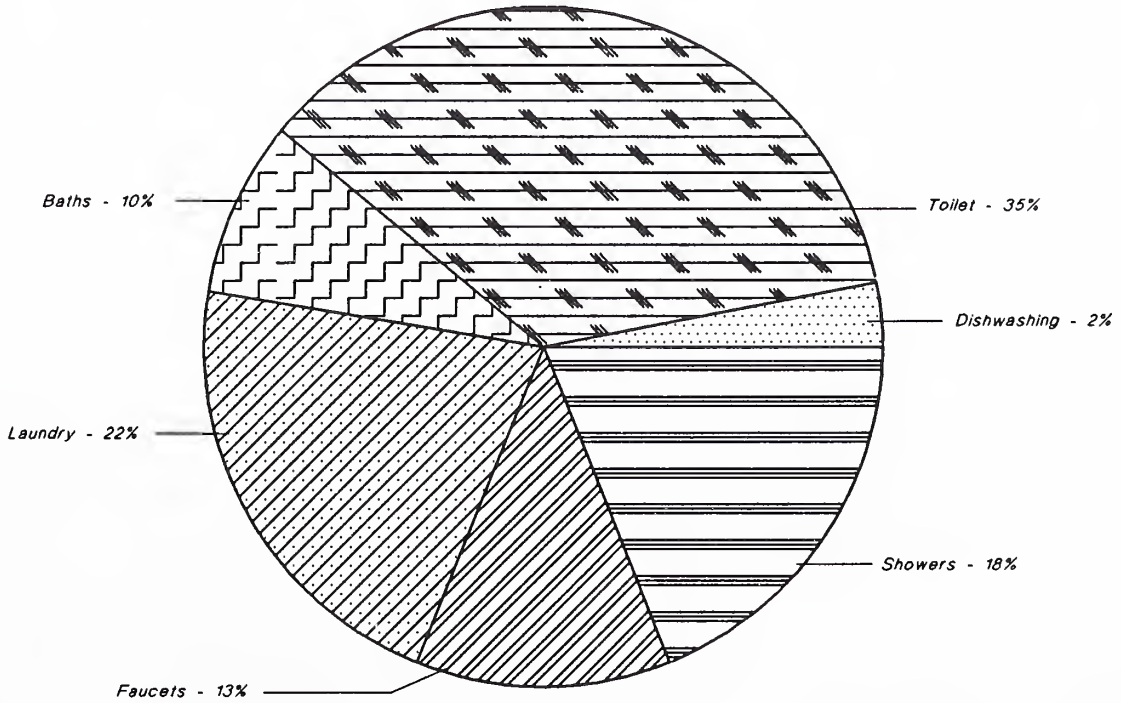
Conventional showerheads typically use between 4 and 8 gallons of water per minute (gpm). Low flow showerheads use no more than 2.5 gpm, yet maintain the same service quality of higher-flow models (RMI, 1991). By replacing one conventional showerhead with a low flow model, water demand can be reduced by 34 to 50 percent in this category (RMI, 1991).

Faucet Aerators

Efficient faucet aerators are inexpensive and easy to install, and can reduce demand in this category by up to 48 percent (RMI, 1991).

Washing Machines

Front-loading washing machines, which tumble clothes on a horizontal axis using a lower volume of water, typically use 40 percent less water than top loading machines which submerge clothes in a tub full of water and agitate them on a vertical axis (RMI, 1991). Additionally, washing machines equipped with suds saver options and/or water level indicators can save 20 to 26 percent of the water normally used without these devices (CDM, 1992).



Residential Indoor Water Use

SOURCE: Maddaus, 1987

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File: PIE5	Drawn By: T. CLARK	Date: DEC. 1992	
ACZ inc ENGINEERING AND ENVIRONMENTAL SERVICES STEAMBOAT SPRINGS, CO 80477	**FIGURE 5**		**TYPICAL WATER USE**

Initial installation of low flow devices in new housing or business developments tends to be the most cost effective way of implementing the use of low flow fixtures. However, retrofit programs can also be quite successful. The City of Aurora, Colorado has implemented a water conservation retrofit program in which kits (which include toilet tank bags, leak detector dye tablets, shower-flow restrictors, and a rain gauge to improve lawn watering efficiency) were sent out to homes built prior to 1977. Savings of up to 6 percent of indoor water use have resulted from this program (CDM, 1992).

2.3.2 Leak Detection

Leak detection surveys done on household water systems are referred to as home water audits. A leaky toilet can waste an average of 750 gallons of water per month and a leaky faucet up to 300 gallons per month (RMI, 1991). This indicates that reducing leaky plumbing can greatly reduce water waste. Another option for conducting water audits is to distribute leak detection kits and allow consumers to detect and repair leaks themselves.

In colder regions of the country, water loss often occurs from water faucets being run continuously in the winter to prevent freezing. Freezing can be prevented, however, by simply insulating water lines and/or crawl-space, and by using thermostatic heat tape.

2.4 OTHER METHODS OF IMPLEMENTING CONSERVATION

2.4.1 Public Education

Since most consumers give little thought to their water use habits except during times of shortage, public education can teach consumers about water conservation techniques and provide a basis for the development of conservation ethics. Consumers must first be made aware of water waste and then learn ways to reduce this waste. Generally, public education programs are strengthened when the need to conserve is high, but benefits associated with teaching people about water efficiency will likely have long-term impacts also. Making full use of education, communication, and media opportunities is important for a successful public education program. School programs, workshops, ET announcements, newspaper feature articles, brochures, and demonstrations are some of the most common programs.

A public education program conducted by a Southern California water district spent 1.3 million dollars on paid advertising to urge customers to conserve water. Their efforts resulted in an 8 percent reduction in total water use (CWA, 1989).

2.4.2 Regulatory Measures

The option to develop and enforce conservation-based water regulations is one which allows municipalities to achieve immediate and long-term results in reducing water demand. It has become increasingly common to modify building and plumbing codes to require low flow devices, mandatory landscaping restrictions, and/or water meters in new developments. Because retrofitting homes and offices with water efficient devices can be time consuming and expensive, it is cost effective to install these devices during initial construction. To encourage retrofitting where needed, however, tax incentives modeled after energy tax credits can be used.

City ordinances can also be used to control water waste. Typically, these ordinances target superfluous water use in city streets, alleyways, and public places, and they often place

restrictions on washing cars and/or watering lawns. As with the implementation of building ordinances, the most successful water regulation programs are enforced. Generally, fines are imposed for non-compliance of ordinance requirements.

Another method that has proven to be effective during droughts (or in regions where water is scarce) is the use of zoning ordinances to restrict development according to the availability of water. Ordinances such as these often require developers to provide sufficient water rights or cash, in lieu of water rights, sufficient to acquire water supplies prior to the approval of the project. Developers must show that they have ample water to adequately service the expected water demand of the proposed project. In some cases, growth has been confined to the service capacity of a municipality's water utility. In Marin County, California, community growth was halted (no further tap permits were issued) when the service capacity of the local water supply was reached (CDM, 1992). It is important to note that this type of policy can increase the cost of living in restricted communities and can also promote growth in surrounding communities.

2.4.3 Water Recycling

Water recycling has been recognized by many as an effective means of conserving water and as a viable alternative to new water supplies. Increased development costs for new water supplies and advances in wastewater treatment capabilities have generated increased interest in water recycling. Typically, water is reused for non-potable purposes. The Denver Water Department, however, has demonstrated that the technology exists to treat wastewater to a potable (drinkable) quality (CDM, 1992).

At this time, effluent from wastewater treatment facilities is generally treated to secondary or tertiary standards. Secondary treatment removes about 90 percent of the biological oxygen demand and the suspended solids in the water, while tertiary treatment goes beyond secondary treatment and removes nutrients such as nitrogen and phosphorous and most of the suspended solids. Water that is treated to either of these standards can be used for a variety of applications, including surface or underground water recharge. The percolation or injection of wastewater into ground water aquifers is known as indirect recycling, and is commonly practiced in many parts of the United States, including California, Florida, and Arizona (CDM, 1992).

Direct use of reclaimed water is most commonly used for landscaping and for large turf area irrigation. The city of Tucson, Arizona uses reclaimed water exclusively to irrigate the city's golf courses (RMI, 1991). Large applications of recycled water such as this can significantly reduce demands on potable water supplies and, in the case of secondary-treated effluent, add valuable nutrients such as nitrates and phosphates to the soil (which in turn reduces demand for costly chemical fertilizers). It is important to note, however, that the use of secondary-treated effluent for irrigational purposes can contribute to non-point source pollution of water supplies.

Direct use of reclaimed water also occurs for industrial and some residential purposes. Gray water is the effluent from bathtubs, showers, bathroom sinks, washing machines, and the non-greasy water from kitchen sinks. Although the use of gray water is not recommended for all applications, it can be filtered and used for irrigational purposes. Home recycling systems in which gray water is categorized and stored for use to flush toilets has been implemented in Windhoek, South Africa, in the Grand Canyon, Arizona, and under emergency conditions, in Chanute, Kansas (CDM, 1992). Due to potential health hazards and regulatory difficulties however, health officials have discouraged these types of systems.

The number, size, and capacity of reuse projects is growing. Currently, there are more than 1,000 wastewater reuse projects in the United States (RMI, 1991). The Los Angeles Sanitation District is well known for its reclamation program which supplies over 66 million gallons of reclaimed water per day to 14 sites throughout the Los Angeles County (RMI, 1991).

2.4.4 Water Rationing

During periods of extreme drought conditions, water rationing can be implemented to achieve significant demand reductions. However, because large-scale reductions tend to decrease revenue from water sales, this type of conservation is used primarily for short-term emergency situations. Water rationing programs are most effective if the public is educated about the water supply problem and if water restrictions are enforced.

2.5 AN EXAMPLE CONSERVATION PROGRAM - GOLETA, CALIFORNIA

One of the best examples of successful water conservation is the program that the community of Goleta, California implemented during a recent emergency drought situation. Instead of developing additional water supplies, the Goleta Water District used incentive programs, rate structures, water metering, and public awareness programs in order to encourage the installation of water efficient fixtures and the use of efficient outdoor watering methods. Over 17,000 ultra low flush toilets were installed. Rebates were given for 14,700 of these toilets, while the remainder were installed primarily because they were required in all new construction, additions, and remodels after 1983. Furthermore, the program gave away approximately 35,000 high-performance showerheads, and hundreds of free on-site surveys identified more efficient outdoor watering methods. The district also imposed a mandatory water rationing plan to reduce use by a total of 15 percent.

Within one year of implementing this program, per capita residential water use fell by 50 percent and total water use fell by over 30 percent, from 135 to 90 gallons per capita day (gpcd). The program, which cost Goleta $1.5 million, resulted in savings which exceeded original water saving goals and it reduced sewage flow by over one-third, eliminating the need for a costly expansion of the wastewater treatment plant (RMI, 1991).

3.0 REGIONAL CONSERVATION SURVEY

The results of two water conservation surveys are presented in this section. Figure 6, Small Community Water Conservation Survey presents the results of a survey done by ACZ (1992) in order to compare the current conservation programs occurring in Steamboat Springs with those occurring in other small resort communities. The average per capita use among the 20 water districts surveyed (including the Mt. Werner and the City of Steamboat Springs Water Districts) is 224 gpcd, but water use rates ranged from 90 to 450 gpcd. (Water use volumes were supplied by each utility and likely calculated using different techniques. Thus, water use rates should be considered rough approximations.) The results of this survey indicate that the most widely used conservation programs are metering, the use of PRVs, new construction ordinances, outdoor water use restrictions, and public education. The percentage of water districts that are either currently using or are in the process of implementing these programs is as follows:

Commercial/Industrial Metering - 90%
Residential Metering - 75%
Pressure Reduction Valves - 75%
New Construction Ordinances - 65%
Outdoor Water Use Restrictions - 50%
Public Education - 50%

In order to compare the results of this survey with the trends of larger communities, a survey done in 1991 by the Colorado Water Utility Council was also obtained. The results of this report, in which 21 Colorado communities were surveyed, appear in Figure 7, Large Community Water Conservation Survey. The average per capita water use among these communities is 175 gpcd, which is less than the average use seen among the smaller communities surveyed above. However, the difference in these use rates is likely due to increases associated with tourism (water used by tourists is often calculated into the per capita water use rate of the permanent population of the town). The most widely used conservation programs among the larger communities are metering, public education, open-space irrigation management, and leak detection. It is interesting to note that only four of the larger communities surveyed (19 percent) have or are in the process of implementing a water conservation master plan. On the other hand, 14 of the smaller communities (70 percent) report that they have or are planning to have a conservation master plan. Another observation of these surveys is that retrofit programs are much more common in the larger communities. Presently, the only resort community in the ACZ survey to implement a retrofit program is Lake Tahoe, California.

COMMUNITY or UTILITY	Consumption (GPCD) Include Tourists	Residential Metering	Pricing Incentives - Residential	Commercial/Industrial Metering	Pricing Incentives - Commercial	Leak Detection	Pressure Reduction Valves	New Construction Ordinance - Low Flow Fixtures	Retrofit Program	Outdoor Water Use Restrictions	Open Space Irrigation Mgt.	Xeriscaping	Non-Potable Re-use	Public Education	Drought Plan	Master Plan	Recently Active Supply Augmentation	COMMENTS
Steamboat Springs	220	S	E	S	N	N	N	N	E	N	N	E	S	N	N	N	Y	Proposing Reservoir Expansion
Mount Werner W+SD	220	S	S	S	S	N	Y	Y	E	N	N	N	N	N	N	S	Y	
Winter Park W.S.D.	U	Y	S	Y	S	N	Y	Y	S	N	N	N	N	N	N	N		
Upper Eagle Valley Cm.SO	137	Y	S	Y	S	Y	Y	S	S	N	N	S	N	Y	S	S		
Created Butte	250	S	N	S	N	Y	Y	Y	N	Y	N	N	E	S	S	Y		Waterahed Menagement - Just doubled Wastewater Treatment Plant Capacity
Telluride	212	N	N	Y	S	Y	Y	E	N	S	N	N	N	N	N	S	Y	
Glenwood Springs	450	S	S	S	S	Y	Y	S	E	Y	Y	N	N	S	Y	S	N	Designing New Treatment Plant
Aspen	260	Y	Y	Y	Y	N	N	Y	N	Y	N	Y	N	Y	N	Y		
Snowmass WSO	90	S	S	S	S	N	S	Y	N	Y	Y	N	N	S	Y	Y	S	
Mid-Valley Metro W.D.	193	N	N	N	N	N	N	N	N	S	N	N	N	N	N	N		
Grand Co. WSD	120	Y	Y	Y	Y	N	N	S	N	N	N	N	N	Y	Y	S	Y	Automatic Treatment Plant
Cripple Creek	U	N	N	Y	S	N	Y	Y	N	N	N	N	E	N	N	N	Y	Planning New Wastewater Plant, Expanded Reservoirs Last Yr.
Basalt	300	Y	Y	Y	Y	Y	N	N	N	Y	S	N	N	N	S	S	Y	
Breckenridge	280	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y		
Dillon	346	N	N	N	N	S	S	Y	N	N	N	N	N	N	N	N	Y	Buying Water Rights
Sundance, UT	110	S	N	S	N	Y	Y	N	N	N	N	N	N	S	N	S		
Park City, UT	243	Y	Y	Y	N	Y	Y	N	N	Y	Y	S	N	Y	N	S	Y	Continued Augmentation Incentives ($)
Taos, NM	153	Y	S	Y	S	N	S	Y	E	N	N	S	N	S	N	S	Y	New Wells New Wastewater Treatment Plant
Lake Tahoe, CA	225	N	N	Y	Y	S	Y	Y	Y	Y	Y	S	N	Y	Y	Y	Y	New Wells
Jackson, WY	U	Y	N	Y	N	S	Y	N	N	S	S	N	N	N	S	N		

NOTE: Consumption volumes were supplied by each utility and likely calculated using different techniques. These should be considered rough approximations.

LEGEND

Y=Yes
S=Starting or Some
E=Evaluating
W.S.D.=Water & Sanitation District
GPCD=Gallons Per Capita Per Day
W.D.=Water District
U=Unknown
N=No

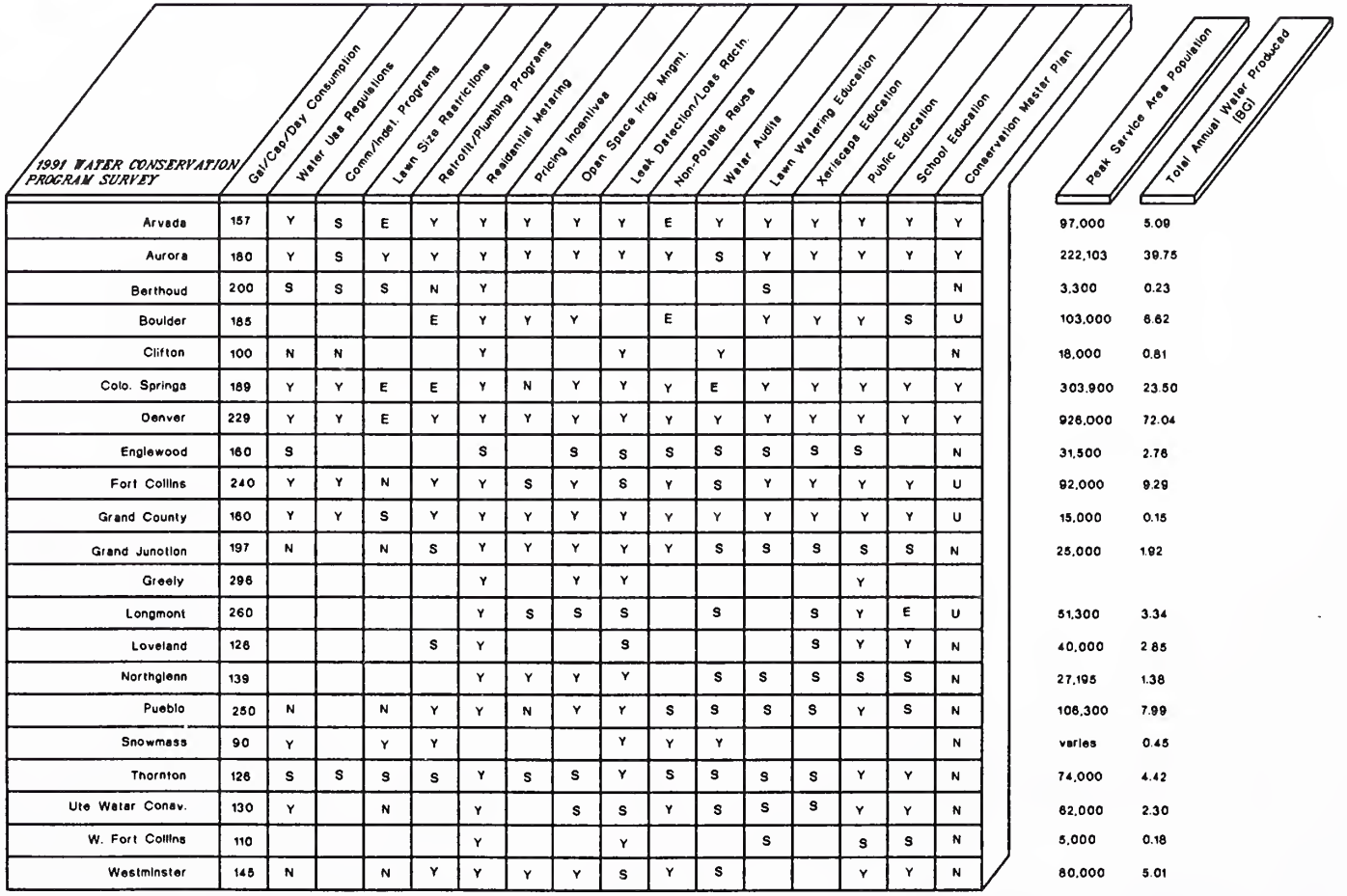
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FIGURE 6

FISH CREEK EIS

SMALL COMMUNITY WATER CONSERVATION SURVEY



1991 WATER CONSERVATION PROGRAM SURVEY	Gal/Cap/Day Consumption	Water Use Regulations	Comm/Indst. Programs	Lawn Size Restrictions	Retrofit/Plumbing Programs	Residential Metering	Pricing Incentives	Open Space Irrig. Mngmt.	Leak Detection/Loss Rdctn.	Non-Potable Reuse	Water Audits	Lawn Watering Education	Xeriscape Education	Public Education	School Education	Conservation Master Plan	Peak Service Area Population	Total Annual Water Produced (BG)
Arvada	157	Y	S	E	Y	Y	Y	Y	Y	E	Y	Y	Y	Y	Y	Y	97,000	5.09
Aurora	180	Y	S	Y	Y	Y	Y	Y	Y	Y	S	Y	Y	Y	Y	Y	222,103	39.75
Berthoud	200	S	S	S	N	Y						S				N	3,300	0.23
Boulder	185				E	Y	Y	Y		E		Y	Y	Y	S	U	103,000	6.62
Clifton	100	N	N			Y			Y		Y					N	18,000	0.81
Colo. Springs	189	Y	Y	E	E	Y	N	Y	Y	Y	E	Y	Y	Y	Y	Y	303,900	23.50
Denver	229	Y	Y	E	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	926,000	72.04
Englewood	160	S				S		S	S	S	S	S	S	S		N	31,500	2.76
Fort Collins	240	Y	Y	N	Y	Y	S	Y	S	Y	S	Y	Y	Y	Y	U	92,000	9.29
Grand County	160	Y	Y	S	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	15,000	0.15
Grand Junction	197	N		N	S	Y	Y	Y	Y	Y	S	S	S	S	S	N	25,000	1.92
Greely	296					Y		Y	Y					Y				
Longmont	260					Y	S	S	S		S		S	Y	E	U	51,300	3.34
Loveland	126				S	Y			S				S	Y	Y	N	40,000	2.85
Northglenn	139					Y	Y	Y	Y		S	S	S	S	S	N	27,195	1.38
Pueblo	250	N		N	Y	Y	N	Y	Y	S	S	S	S	Y	S	N	106,300	7.99
Snowmass	90	Y		Y	Y				Y	Y	Y					N	varies	0.45
Thornton	126	S	S	S	S	Y	S	S	Y	S	S	S	S	Y	Y	N	74,000	4.42
Ute Water Conav.	130	Y		N		Y		S	S	Y	S	S	S	Y	Y	N	62,000	2.30
W. Fort Collins	110					Y			Y			S		S	S	N	5,000	0.18
Westminster	145	N		N	Y	Y	Y	Y	S	Y	S			Y	Y	N	80,000	5.01

LEGEND

Y=Yes BG=Billion Gallons
N=No
S=Some
E=Evaluating

Source: Hobbs, 1991 (Used with the permission of the Colorado Water Utility Council.)

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File: WCPS.DWG	Drawn By: T. CLARK	Date: DEC. 1992

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FIGURE 7

FISH CREEK EIS

LARGE COMMUNITY WATER CONSERVATION SURVEY

4.0 LOCAL WATER CONSERVATION PROGRAMS

At this time, neither the Mount Werner Water and Sanitation District (Mt. Werner) nor the City of Steamboat Springs (City) have formal water conservation plans. However, in order to comply with local and state law and in an effort to encourage future conservation, both districts are presently involved in various programs aimed at conserving water.

4.1 CITY OF STEAMBOAT SPRINGS

Information obtained on the City of Steamboat Springs was provided by Dan Birch (1992).

4.1.1 Metering/Rate Structuring

In order to delay the need to increase the capacity of treatment facilities and in accordance with Colorado's Water Metering Act of 1990, the installation of water meters in both the residential and commercial sectors of the City was completed in 1990, and meter based billing is expected to begin in early 1993. Although the City still uses a flat rate structure, data is being obtained from water meters in order to determine the rate structures that will be implemented in 1993. According to the City, residents will face an inclining block rate structure that will be initiated in phases over a three year period. During the first three years of implementation, service charges will decrease annually while volume charges per 1,000 gallons will increase annually. The advantage of this phased approach is that consumers can gradually implement different methods of conservation as they get accustomed to the rate structure. Commercial consumers, on the other hand, will face a declining block rate structure and will also be subject to a basic service charge.

4.1.2 System Maintenance

The City has recently begun replacing all of their main water lines. The program, which began five years ago, involves the replacement of approximately 40 miles of water pipes over a 30 year period. It is estimated that the entire system will be replaced by the year 2020. Although the City has no formal leak detection program included with the maintenance being done, the replacement of the water lines will reduce leakage and the installation of meters will increase the City's ability to determine the amount of water being lost to leaks.

4.1.3 Irrigation Restrictions

Lawn watering is restricted between the hours of 10:00 AM and 5:00 PM, but compliance is strictly voluntary as no enforcement of this regulation exists. The *Steamboat Today* publishes weekly irrigation requirements according to local precipitation patterns, and prescribes different homes to water on different days (according to address). Again, compliance with these guidelines is voluntary.

4.1.4 Raw Water Use

Raw, untreated water is currently taken from the Yampa River and used for snow-making at the Howelsen Hill Ski Area. The use of raw water, although not necessarily a conservation technique, helps to reduce the demand for potable water and thus results in treatment cost savings.

4.1.5 Xeriscape Grant

The City of Steamboat Springs has received a $19,000 grant from the Colorado State Office of Water Conservation (COWC) in order to partially fund the design and construction of a high-altitude xeriscape demonstration at Howelsen Hill Park. Intended to introduce the community to the idea of xeriscaping, the demonstration will compare the water use, maintenance, and visual appearance of a "xeriscape" to that of a "normal" landscape. In addition, a guide to water efficient landscapes in Colorado mountain communities will be developed. The demonstration is planned for the summer of 1993.

4.1.6 Plumbing Retrofit Grant

The City of Steamboat Springs has been selected as the test site for a study on the cost effectiveness of retrofitting tourist-oriented lodging complexes. The study will be conducted by the Northwest Colorado Council of Governments and will be funded by a $20,425 grant issued by the COWC. The study will analyze the water use patterns of tourists and will compare the water demand in retrofitted condominiums to demand in non-retrofitted condominiums. From the data obtained, the cost effectiveness of retrofitting large condominiums, including the potential savings that can result, will be determined. The findings of this study will be made available to all resort communities.

4.1.7 Pressure Reduction Valves

The City requires the use of PRVs in order to ensure that the water pressure in its system does not exceed 60 pounds psi. PRVs are installed, not only on main lines, but at each point of use in the system. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system. Water pressure has direct effects on the flow rates of common plumbing fixtures and should thus be maintained at 50-60 psi for maximum efficiency.

4.2 MOUNT WERNER WATER AND SANITATION DISTRICT

Information obtained on the Mount Werner Water and Sanitation District was provided by John Fetcher (1992).

4.2.1 Metering/Rate Structuring

The installation of water meters in the residential and commercial sectors of the district was completed in 1991 and meter based began on January 1, 1993. Mt. Werner will use a different rate structure than the City. Consumers will be charged a base rate that includes a service charge and will receive 10 cubic meters (approximately 2,640 gallons) of water per month. Water usage above this monthly allotment will be billed on a per cubic meter basis. This rate structure will be used for both residential and commercial consumers.

4.2.2 Lawn Irrigation

Like the City, lawn watering in Mt. Werner is restricted between 10:00 AM and 5:00 PM and information on efficient irrigation is provided in the *Steamboat Today.*

4.2.3 New Construction Ordinance

According to Mt. Werner, their Rules and Regulations (April, 1991) require all new buildings constructed in the Mt. Werner Water District to have water efficient plumbing fixtures, including low flow toilets, low flow showerheads, and faucet aerators.

4.2.4 Pressure Reduction Valves

Mt. Werner requires the use of PRVs in order to ensure that the water pressure in their system does not exceed 60 inch psi. The PRVs protect the system from fluctuations in water pressure and, in turn, increase the efficiency of the water system.

4.2.5 Raw Water Use

Like the City, Mt. Werner promotes the use of raw water in some circumstances in order to reduce demand for treated water. The Steamboat Ski Area uses water from the Yampa River to make snow and the Sheraton Golf Course uses water from Fish Creek for irrigation.

4.2.6 Plumbing Retrofit Grant

The Mt. Werner Water and Sanitation District is assisting the City of Steamboat Springs with the study on the cost effectiveness of retrofitting condominiums with low flow devices.

5.0 REFERENCES

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APPENDIX D

INFILTRATION GALLERY ANALYSIS

Fish Creek Reservoir EIS
Infiltration Gallery Alternative Analysis
City of Steamboat Springs
January 11, 1993

INTRODUCTION

At the September 16, 1992, interagency meeting with the Forest Service, Corps of Engineers, Environmental Protection Agency, and Fish and Wildlife Service, mention was made of expanded infiltration galleries as a potential lesser impact water supply alternative to the reservoir enlargement. The purpose of this brief paper is to discuss and compare the reservoir enlargement and an expanded system of infiltration galleries.

BACKGROUND

The City and Mount Werner have both developed infiltration galleries (also known as well fields) to augment treated water provided from Fish Creek and the Fish Creek Filtration Plant. This has been done primarily to provide peaking capacity during high summer demands when landscape irrigation strains the capacity of the filtration plant. The galleries also provide a point of redundancy in the water supply system, providing the only completely independent means to place treated water into the distribution system.

The practice of Mount Werner and the City has not been to rely on the infiltration galleries to meet demands. Moreover, from a utility operation perspective as well as an environmental perspective, the expansion of the galleries in lieu of an enlarged Fish Creek reservoir is not desirable. The reasons for this include poor water quality, potential net depletions to the Yampa River, no instream flow on Fish Creek, greater Fish Creek reservoir drawdowns, excessive operational costs, and impacts to Puppy Dog Lake drainage. Each of these are discussed in greater detail in the following sections.

WATER QUALITY

Groundwater in the Yampa Valley generally is of poor quality because of high mineral content. Groundwater from Mount Werner's and the City's galleries have manganese and iron concentrations that exceed water quality standards by as much as an order of magnitude. While this presents no health impact, it produces an offensive tasting water that creates significant impacts such as staining of laundry and plumbing fixtures. It has also led to severe water quality problems in pools, including the health and recreation center pool. The pool has experienced water to have an emerald green color so deep that the bottom of the pool is not visible. This creates an unsafe situation and also greatly affects the pool's business.

While the galleries play an important role as a peaking supply and an emergency supply alternative, because of the obvious and serious water quality problems, the City and Mount Werner have sought to minimize their use.

YAMPA RIVER DEPLETIONS

The infiltration galleries may be operated under direct flow water rights with storage water available in Stagecoach Reservoir that may be released if the junior direct flow rights were ever called out of priority. A call has never been placed on this reach of the Yampa River, meaning it is not likely an appreciable amount of water would ever need to be released from Stagecoach to augment direct flow diversions. This would then mean that during late summer, fall, and winter months when habitat for threatened and endangered fish species is threatened by low flows, the galleries will be operating, creating further depletions to the Yampa River.

In contrast, because Fish Creek stores a portion of the spring runoff, use of Fish Creek reservoir provides for the release of storage water and augmentation of native flows over that same time period. Even considering consumptive losses, the net effect to the Yampa River will be an increase in flows during low flow months.

INSTREAM FLOW, RESERVOIR DRAWDOWN, AND OPERATIONAL COSTS

Presently, the infiltration gallery is remotely operated from the Fish Creek Filtration Plant. Greatly expanding the galleries and adding treatment to improve water quality to achieve a water quality comparable to Fish Creek water will not only represent a very high capital cost, but will also mean the galleries and their attendant treatment facilities will be continuously staffed by operators, creating high and inefficient operations costs. Operational costs will also be higher because treated water from the galleries is delivered into the distribution by means of high pressure pumps whereas the Fish Creek system is a gravity system.

Because of the high operational costs of the galleries, the inevitable operational practice that would result would be to maximize supplies from Fish Creek. This would lead to greater winter drawdowns that could threaten the lake fish population. It would also result in decreased Fish Creek instream flows below the intake to the Fish Creek Filtration Plant.

PUPPY DOG LAKE DRAINAGE

With the construction of the saddle dam and spillway during the last enlargement of Fish Creek Reservoir, flows which historically were routed down the Middle Fork of Fish Creek were routed through the Puppy Dog Lake drainage. Based upon field work undertaken through the EIS for the proposed reservoir expansion, it has come to light that these flows have evidently caused streambank erosion along the Puppy Dog Lake drainage. Evidently the flows routed through Puppy Dog Lake are much greater than native flows in the

Puppy Dog Lake basin.

The proposal to enlarge the reservoir will also include provisions to restore the historic routing of peak spring flows and any other flows that might be of such a magnitude to be erosive, through the Middle Fork of Fish Creek. Without the enlargement erosive flows would continue to be routed through the Puppy Dog Lake drainage.

cc: Council; Misc

Steamboat Springs HRA

Steamboat Springs Health & Recreation Association · 136 Lincoln Avenue · P.O. Box 1211 · Steamboat Springs, CO 80477 · 879-1828

October 1, 1992

Steamboat City Council
Box 775088
Steamboat Spgs, CO 80477

Dear City Council Members:

The Board of Directors has asked me to update you on some problems we incurred here at Health & Rec. because of the city putting a new well on line in late June.

Over that weekend in late June the water in the big pool turned inexplicably green and turbid even though we were treating it the same as we always did. We had many people give us negative comments and many leave because the water was too "dirty". Not knowing the cause, we drained the pool for a day to investigate. This caused us loss of revenue and many complaints. After calling in Crystal River Spas we found out other pools were having the same problems and that it was caused by the "new" city water. We then spent $600 on chemicals and many man hours turning the water back to its original state. Simultaneous to this the city turned off that well. The water returned to normal.

We were in contact with Dan Birch from the city the entire time and found him very cooperative. Dan has told us now that that well will be back on line this fall and again next summer.

The Board wants to let you know the situation and requests anything you can do to help with this problem. Because of our non-profit status and tight budgeting having to deal with this kind of water on an on-going basis would prove a severe hardship. If there is any way to pre-treat this water or let us know ahead of time what to do with it, it would help us considerably.

Please let me know if there is anything you can do to help with this problem. From a public relations aspect it is disastrous for us to have that kind of "dirty" water here.

Sincerely,

Patricia E. Carney
General Manager

APPENDIX E

EMERGENCY PREPAREDNESS PLAN

City of
Steamboat Springs

M E M O R A N D U M

TO: Ed Burch, Routt County Sheriff
Roger Jensen, Chief of Police
Smokey Slaven, Captain of Ambulance Service
Jay Muhme, Fire Marshal
Ed Blank, Division Engineer

FROM: Joe Zimmerman, Utility Systems Superintendent JZ

DATE: July 17, 1992

SUBJECT: Emergency Preparedness Plan

Attached for your records is a copy of the City of Steamboat Springs Emergency Preparedness Plan. This plan is to be used in case of a dam failure on Fish Creek Reservoir.

Please review the plan and if you have comments, please submit them to me.

P.O. Box 775088, Steamboat Springs, Colorado 80477
City Hall - 879-2060; Utility Accounting - 879-6993; Police - 879-1144; Public Works Shop - 879-1807
Steamboat Springs Airport - 879-9042; Transit - 879-5585; FAX: 303-879-8851

DATA SHEET

NAME OF DAM Fish Creek Reservoir

NAME OF DAM OWNER City of Steamboat Springs

* OWNERS REPRESENTATIVES RESPONSIBLE FOR EXECUTING THE EMERGENCY PLAN

	Name	Position	Contact at Phone
* 1.	Dan Birch	City Engineer	879-2060
* 2.	Joe Zimmerman	Utilities Super.	879-2060

PERSON RESPONSIBLE FOR DRAFTING AND UPDATING THIS PLAN Dan Birch

DAM LOCATION: Sec., 11 Twnship. 6N Rng. 83W PM 6th

RIVER OR STREAM Fish Creek COUNTY Routt

FOREST OR OTHER Routt National Forest

NEAREST TOWN IN FLOOD PLAIN Steamboat Springs

ESTIMATED TIME FOR FLOOD TO REACH NEAREST TOWN .5 HR

ESTIMATED TIME FOR FLOOD TO REACH NEAREST HOME .33 HR

DIRECTIONS FROM TOWN TO DAM 6.3 miles east

DAM HEIGHT 64 Ft., CAPACITY 1850 A.F.

SURFACE AREA 79.5 A.C., HAZARD RATING Class I

CREST LENGTH 650 Ft., CREST WIDTH 20 Ft.

MAX. OUTLET CAPACITY 3500 C.F.S.

SPILLWAY CAPACITY FOR EACH FOOT OF DEPTH

Depth	Surcharge Storage	Service Spillway Capacity	Same as Service Sp Emergency Spillway Capacity
1 ft.	1900 AF	260 CFS	N/A CFS
2 ft.	1960 AF	720 CFS	N/A CFS
3 ft.	2040 AF	1320 CFS	N/A CFS
4 ft.	2140 AF	2110 CFS	N/A CFS
5 ft.	2260 AF	3225 CFS	N/A CFS
6 ft.	2410 AF	4700 CFS	N/A CFS

WHERE DRAWINGS & DAMSITE EQUIPMENT ARE KEPT City Offices,

137 10th Street, Steamboat Springs, Colorado

EMERGENCY PLAN

ESTIMATED TRAVEL TIME TO SITE

1. Arrange for immediate inspection of the site:

Person responsible Dan Birch

Person familiar with site to make inspection Dan Birch 1 hr.

Engineer to make inspection Dan Birch 1 hr.

2. Establish communication with participants:

Person responsible Dan Birch

Alternate Joe Zimmerman

3. Notify State Engineer's Office:

Water Commissioner Elvis Iacovetto 736-8308 (Home) 2 hr.
To make provision for increased flow downstream
879-0272 (Office)

Dam Safety Branch Sally Lewis 870-0476 (Home) 1 hr.
To inspect dam and recommend or concur with remedial action

4. Provide required equipment:

Owner can provide Loaders, backhoes, excavator, graders, trucks

3 hr.

Contractor "A" can provide - Loaders, excavators, dozers, trucks

3 hr.

Contractor "B" can provide - Same as A

3 hr.

Highway Department can provide - All State owned heavy equipment depending on seriousness of situation. unknown hr.

D.O.D.E.S. can provide - Facilitation and coordination with any and all resources available for emergency assistance statewide. hr.

Contractor "A" can provide -

hr.

DATA SHEET

NAME OF DAM Fish Creek Reservoir

NAME OF DAM OWNER City of Steamboat Springs

* OWNERS REPRESENTATIVES RESPONSIBLE FOR EXECUTING THE EMERGENCY PLAN

	Name	Position	Contact at Phone
* 1.	Dan Birch	City Engineer	879-2060
* 2.	Joe Zimmerman	Utilities Super.	879-2060

PERSON RESPONSIBLE FOR DRAFTING AND UPDATING THIS PLAN Dan Birch

DAM LOCATION: Sec., 11 Twnship. 6N Rng. 83W PM 6th

RIVER OR STREAM Fish Creek COUNTY Routt

FOREST OR OTHER Routt National Forest

NEAREST TOWN IN FLOOD PLAIN Steamboat Springs

ESTIMATED TIME FOR FLOOD TO REACH NEAREST TOWN .5 HR

ESTIMATED TIME FOR FLOOD TO REACH NEAREST HOME .33 HR

DIRECTIONS FROM TOWN TO DAM 6.3 miles east

DAM HEIGHT 64 Ft., CAPACITY 1850 A.F.

SURFACE AREA 79.5 A.C., HAZARD RATING Class I

CREST LENGTH 650 Ft., CREST WIDTH 20 Ft.

MAX. OUTLET CAPACITY 3500 C.F.S.

SPILLWAY CAPACITY FOR EACH FOOT OF DEPTH

Same as Service Sp

Depth	Surcharge Storage	Service Spillway Capacity	Emergency Spillway Capacity
1 ft.	1900 AF	260 CFS	N/A CFS
2 ft.	1960 AF	720 CFS	N/A CFS
3 ft.	2040 AF	1320 CFS	N/A CFS
4 ft.	2140 AF	2110 CFS	N/A CFS
5 ft.	2260 AF	3225 CFS	N/A CFS
6 ft.	2410 AF	4700 CFS	N/A CFS

WHERE DRAWINGS & DAMSITE EQUIPMENT ARE KEPT City Offices.

137 10th Street, Steamboat Springs, Colorado

EMERGENCY PLAN

ESTIMATED TRAVEL TIME TO SITE

1. Arrange for immediate inspection of the site:

Person responsible Dan Birch

Person familiar with site to make inspection Dan Birch 1 hr.

Engineer to make inspection Dan Birch 1 hr.

2. Establish communication with participants:

Person responsible Dan Birch

Alternate Joe Zimmerman

3. Notify State Engineer's Office:

Water Commissioner Elvis Iacovetto 736-8308 (Home) 2 hr.
To make provision for increased flow downstream 879-0272 (Office)

Dam Safety Branch Sally Lewis 870-0476 (Home) 1 hr.
To inspect dam and recommend or concur with remedial action

4. Provide required equipment:

Owner can provide Loaders, backhoes, excavator, graders, trucks

3 hr.

Contractor "A" can provide - Loaders, excavators, dozers, trucks

3 hr.

Contractor "B" can provide - Same as A

3 hr.

Highway Department can provide - All State owned heavy equipment depending on seriousness of situation. unknown hr.

D.O.D.E.S. can provide - Facilitation and coordination with any and all resources available for emergency assistance statewide. hr.

Contractor "A" can provide -

hr.

EMERGENCY PLAN CONT.

6. Provide required manpower:

Owner can provide 20-30 Personnel 1½ hr.

College "A" can provide - N/A hr.

U.S. Military can provide - Per State and National Disaster E.P.P. 2-4 hr.

Radio appeal can provide - Unknown hr.

7. Implement warning and/or evacuation:

Owner will - Notify public safetyagencies ½ hr.

D.O.D.E.S. will - Facilitate Search and Rescue operations with available agencies within the State. hr.

County Sheriff will - Coordinate all agencies involved in warning, excavation, and search and rescue operations. ½ hr.

State Patrol will - Assist the Sheriff's Department ½ hr.

Fire Department will - Assist the Sheriff's Department ½ hr.

8. Medical or other assistance:

Routt County Search & Rescue
Routt Memorial Hospital will provide EMT's, Search & Rescue, Ambulatory, Medical Services & Facilities ½ hr.

9. Helicopter Service:

will provide Search and Rescue Transportation, Ambulatory 1½ hr.

10. Engineering firm can provide Technical assistance in impeding, diverti repairing, and stopping dam breaks and water flows. hr.

11. Report on actions taken:

Person Responsible - Dan Birch hr.

AMBULANCE SERVICE

	Name	Position	Address	Phone
1.	Smokey Slaven	Captain	911 Yampa Avenue	879-7170
2.	Matt Newman	Lt.	same as above	879-7170

HELICOPTER SERVICE

	Name	Position	Address	Phone
1.	Dynamic Aviation Helicopters		2225 South 3250 East Vernal, UT 84078	(801) 789-7200
2.	Helicopter Roundup Services		Maybell, CO 81604	(303) 272-9931

DIVING SERVICE

	Name	Position	Address	Phone
1.	Jay Muhme	Fire Marshal	840 Yampa Ave.	879-0700
2.	Roy Mack	Fireman	same as above	879-0700

OTHER

	Name	Position	Address	Phone
1.				
2.				

PERSONS DOWNSTREAM FIRST AFFECTED BY FLOOD WATERS

	Name	Address	Phone	No. of Residents
1.				
2.				
3.				
4.				
5.				
6.				

SEE NEXT PAGE

DIRECTORY

OWNERS REPRESENTATIVES RESPONSIBLE FOR PLANNED ACTION & CONTACT LOCATION

Name	Position	Address	Phone
1. Dan Birch	City Engineer	137 10th Street	879-2060
2. Joe Zimmerman	Utility Sys. Supt	137 10th Street	879-2060
3. Kirk Madsen	Public Works Dir.	137 10th Street	879-2060
4. Roger Jensen	Chief of Police	840 Yampa Avenue	879-1144
5. Doug Marsh	Street Supt.	30415 Moffat Ave.	879-1807

CITY OF Steamboat Springs

Name	Position	Address	Phone
1. Dan Birch	City Engineer	137 10th Street	879-2060
2. Joe Zimmerman	Utility Sys. Supt.	137 10th Street	879-2060

COUNTY SHERIFF -

Name	Position	Address	Phone
1. Ed Burch	Sheriff	30007 W. U.S.40 Steamboat Spgs	879-1090 or 9
2. Art Fiebing	Under Sheriff	same as above	879-1090 or 9

OFFICE OF STATE ENGINEER

Name	Position	Address	Phone
Hal Simpson	Acting State Engineer	1313 Sherman Denver	866-3581
Alan Pearson	Dam Safety Branch	same as above	866-3581
Ed Blank	Division Engineer	320 Lincoln Steamboat Spgs	879-0272
Elvis Iacovetto	Water Commissioner	21400 3rd Oak Creek	736-8308

D.O.D.E.S.

Name	Position	Address	Phone
1. Jack Truby		24 hr. emergency	279-8855
2. Lynn Boulas		same as above	279-8855

PERSONS DOWNSTREAM FIRST AFFECTED BY FLOOD WATERS

ADDRESS	NAME	PHONE	# OF RESIDENTS
1175 Steamboat Blvd.	Mount Werner Water & San.	879-2424	
1154 Anglers	C.A. Walker	Unknown	*
1158 Anglers	C.A. Walker	Unknown	*
1168 Fish Creek Lane	Bess Peebles	879-2996	1
1173 Fish Creek Lane	Heinz-Juargen Astein	879-5591	4
Fish Creek Lane	Hart Peebles	879-2915	*
1179 Fish Creek Lane	Francis Quinlan & Francisco Briseno	879-7673	*
Fish Creek Lane	Bob Snyder	879-2686	*
1184 Anglers Drive	Walter I. Waldrop	879-8561	*
1190 Anglers Drive	B.J. Powell	879-3362	6
1215 Anglers Drive	Chaparral Terraces 12 units		
550 Rollingstone Drive	Selbe Seniors Apts. 24 units		
1500 Pine Grove Road	H.K. Selbe	879-5450	2
1580 Pine Grove Road	Evangelical Free Church	879-3020	
1580 Pine Grove Road	Hampden Industries, Ltd.	879-0436	
1485 Pine Grove Road	Pine Grove Condos - A Complex	879-1535	
1485 Pine Grove Road	Pine Grove Condos - B Complex	879-1535	
1480 Pine Grove Road	James D. Selbe	879-0737	4
1250 S. Lincoln	Sundance Plaza	879-1600 x 596	
37500 U.S. Highway 40	Safeway	879-3766	
1450 S. Lincoln	Ski Haus	879-0385	
1475 Pine Grove Road	Pine Grove Center	879-0936	
1465 Pine Grove Road	Pine Grove Restaurant	879-1190	
1445 S. Lincoln	Big Country Reality	879-0728	
1355 S. Lincoln	American Fundware, Inc.	879-5770	
1255 S. Lincoln	Kinderhaus Day Care	879-3761	
1255 S. Lincoln	Fish Creek Campground		
1235 S. Lincoln	Kevin Harte	879-7753	6
1245 S. Lincoln	Fish Creek Trailer Park		65 Units

PERSONS DOWNSTREAM FIRST AFFECTED BY FLOOD WATERS

ADDRESS	NAME	PHONE	# OF RESIDENTS
1475 S. Lincoln	Mountain Resorts Laundry	879-3407	
1475 S. Lincoln	Ski Country Designs	879-2111	
1479 S. Lincoln	Yampa Valley Lumber	879-5550	
1485 S. Lincoln	Mountain West Environments	879-2313	
1445 S. Lincoln	Mount Werner Water & San Shop	879-2497	

* VACATION HOMES

DAM INCIDENT REPORT FORM

DATE _____ TIME _____

NAME OF DAM _____

STREAM NAME _____

LOCATION _____

COUNTY _____

NATURE OF PROBLEM _____

_____

LOCATION OF PROBLEM AREA (LOOKING DOWNSTREAM) _____

_____

EXTENT OF PROBLEM AREA (MEASURE, PACE, OR ESTIMATE) _____

_____

ESTIMATED QUANTITY AND COLOR OR UNUSUAL FLOW _____

_____

WATER LEVEL IN RESERVOIR _____

NAME OF PERSON WHO OBSERVED CONDITION _____

PHONE OR HOW TO CONTACT OBSERVER _____

WAS SITUATION WORSENING? _____

DOES IT APPEAR TO BE AN EMERGENCY? _____

WHAT ARE CURRENT WEATHER CONDITIONS AT THE SITE? _____

_____

OTHER _____

_____

_____

_____

_____


Steamboat Springs
Buffalo Mountain
Mount Werner
STEAMBOAT SKI AREA
Q = 20,971 cfs
Q = 17,976 cfs
Q = 14,463 cfs
T = 39 min

Q = 12,053 cfs.
T = 1 hr. 11 min.

Q = 8286 cfs.
T = 2 hr. 52 min.

APPENDIX F

DAMBREAK ANALYSIS

Woodward-Clyde Consultants

Engineering & sciences applied to the earth & its environment

October 6, 1992

Mount Werner Water and Sanitation District
1175 Steamboat Boulevard
Steamboat Springs, CO 80488-339

Attention: Mr. John R. Fetcher, Secretary

Subject: Dambreak Analysis for Fish Creek Dam Enlargement, Routt County, Colorado
Project No. 22988 (T2)

Dear Mr. Fetcher:

Woodward-Clyde Consultants (WCC) has completed a dambreak analysis for inclusion into the Environmental Impact Study for the Fish Creek Dam. This analysis will assist in the design of the early warning system to evacuate the floodplain areas which would be inundated in case of a dam failure. The dambreak analysis consisted of a breach analysis for the existing dam at normal water surface elevation (WSEL) of 9866, an alternative dam raise at normal WSEL of 9875 and the proposed dam raise at a normal WSEL of 9886.

Methodologies

The dambreak analysis was performed using the U.S. Army Corps of Engineers, HEC-1 model. The "sunny day" dam failure parameters were developed from methodologies presented in the U.S. Department of Interior, Bureau of Reclamation, ACER Technical Memorandum No. 7. The "sunny day" failure was assumed to produce the worst case incremental flood in the Town of Steamboat Springs. This analysis is believed to be the worst case for the potential for loss of life due to the unexpected nature of the failure. If a flood due to a large rainfall event in conjunction with a dam failure was occurring, the potential of loss of life is believed to be less because residents living within the flood plain are aware of an on-coming flood due to rainfall. The parameters were calibrated to an empirical dambreak peak flow equation presented in ACER Technical Memorandum No. 7 and to peak flows from actual dam failures. The dambreak hydrograph was routed downstream in Fish Creek and the Yampa River through the Town of Steamboat Springs. The routing was performed using the normal depth storage routine in HEC-1.

Stanford Place 3, Suite 1000 • 4582 South Ulster Street • Denver, Colorado 80237-2637
303-694-2770 • Fax 303-694-3946

Reservoir and Watershed Characteristics

The stage-storage curve used in the dambreak analysis was developed by Civil Design Consultants (CDC) in 1983 for the Evaluation of Fish Creek Reservoir Enlargement Alternatives Report. The water surface elevation for each of the alternatives and the corresponding volumes were input into the HEC-1 model for the dambreak analysis.

The cross sections used to route the dambreak hydrograph downstream were extrapolated from the U.S.G.S. quadrangles upstream of the Mount Werner Water Treatment Plant. The 2-foot contour maps of the Town of Steamboat Springs produced by D & D Consultants in 1972 and photo revised in 1979 were used downstream of the water treatment plant through the Town of Steamboat Springs on the Yampa River. The cross sections used within the corporate limits of the Town of Steamboat Springs are shown on Drawings 1 and 2. The Mannings "n" values for Fish Creek and the Yampa River were estimated during a site visit on August 31 and September 1, 1992. The stream stationing was estimated from the U.S.G.S. quadrangle maps.

Due to the type of modelling used in this analysis, the amount of flow which would travel upstream on the Yampa River at its confluence with Fish Creek from a flood wave traveling downstream on Fish Creek was neglected. This should result in a conservative estimate of the flood peaks, depths and travel times downstream on the Yampa River.

There are two U.S.G.S. gage stations located within the study area. One gage (U.S.G.S. Station # 09238900) is located on Fish Creek near the Mt. Werner Water Treatment Plant and the other gage (U.S.G.S. Station # 09239500) is located on the Yampa River at the 5th Street Bridge. The Fish Creek gage has a published period, of 15 years, from 1967 through 1990. The Yampa River gage at Steamboat Springs has a published period of record, of 83 years, from 1905 through 1990.

Table 1 summarizes WCC's flow-frequency analysis using the log-Pearson Type III statistical analysis for the two U.S.G.S. gages. A log-Pearson Type III analysis uses the maximum flood peak in a water year for the period of record to develop a statistical flow-frequency curve. The maximum flood peaks for the period of record for both gages are from the months of April, May and June. The floods which occur during these months are typically associated with snowmelt. Therefore, it is assumed there have not been any recorded flood peaks associated with rainfall events.

The Federal Emergency Management Agency (FEMA), in 1976, conducted a flood insurance study (FIS) for the Town of Steamboat Springs. The FIS presented a flow - frequency analysis which included both a snowmelt analysis and was supplemented with a rainfall-runoff analysis for the higher frequency events. The FIS report did not state how the rainfall-runoff analysis was performed. The results of the FEMA study are summarized in Table 1. The log-Pearson Type III analysis and the FIS results are presented for comparing the flood peaks associated with flood flows and the dambreak.

Dam Breach Parameters

A dam breach can be defined as a failure of any reservoir structure which allows an uncontrollable discharge of water. Typically, a failure results from overtopping of the dam or piping. The proposed dam will be designed to pass the probable maximum flood (PMF) without overtopping. Therefore, for this investigation a piping failure is assumed. The piping failure is assumed to occur with the reservoir at the crest of the spillway. This type of analysis is typically called a "sunny day" dam failure.

The following regression equation, based on actual dam failures, is used to estimate peak discharges:

$$Q = 39\,(D)^{1.81}\,(S)^{0.061}$$

Q - Peak discharge (cfs)
D - Depth of water behind dam at time of failure (ft)
S - Volume of storage at time of failure (ac-ft)

The regression equation is based only on the depth of storage and the volume of storage in the reservoir. The predicted results from the regression equation were compared to actual dam failures to check if the results were within a reasonable range for similar failures.

To predict the peak flow resulting from a dam failure the breach width, breach side slopes and time of failure must be estimated. Based on ACER Technical Memorandum No. 7, the breach width can vary from 0.5 to 3.0 times the height of the dam, the side slopes can vary from 0:1 to 1:1 and the failure time can ranged from 0.5 to 4.0 hours. These parameters which were input into HEC-1 and were calibrated to the regression equation presented in ACER Technical Memorandum No. 7.

Analyses/Results

The existing dam has a hydraulic height of 46 feet (elevation 9820 is assumed zero storage from the stage-storage curve in the CDC, 1983 Report) with a WSEL of 9866 and storage volume of 1840 ac-ft (CDC, 1983). The regression equation predicted a peak discharge of 63,100 cfs. There were two similar published dam failures which have occurred, the Buffalo Creek, WV and the Laurel Run, PA dam failures. The Buffalo Creek dam had a depth of 46 ft. and a storage volume of 404 ac-ft which resulted in a 50,000 cfs peak discharge. The Laurel Run dam had a depth of 42 ft. and a storage volume of 310 ac-ft which resulted in a 37,000 cfs peak discharge. Although the two similar dam failures did not have as much storage volume as the existing dam, the predicted results were assumed to be within reason.

The calibrated dam breach parameters input into HEC-1 for the existing dam are a maximum breach width of 138 ft, side slopes of 0:1 and time of failure of 0.9 hrs. These parameters resulted in a peak discharge of 63,200 cfs.

The dam failure hydrograph was routed downstream and the results at selected locations are presented in Table 2. An apparent anomaly exists downstream of the Fish Creek Dam on Fish Creek at the Mount Werner Water Treatment Plant. The flow is decreasing while the flow depth is increasing. This may be explained because the gradient of the creek is reduced naturally in the downstream direction. The slope of the channel is 0.0975 ft/ft at the upstream end and 0.0167 ft/ft at the downstream end of the stream.

The alternative dam raise has a hydraulic height of 55 ft. with a WSEL of 9875 and a storage volume of 2,750 ac-ft (CDC, 1983). The regression equation predicts a peak discharge of 89,300 cfs. There were no published dam failures in ACER Technical Memorandum No. 7 which were similar in dam height and volume.

The calibrated dam breach parameters input into HEC-1 for the alternative dam raise are a maximum breach width of 165 ft, side slopes of 0:1 and a time of failure of 0.7 hrs. These parameters resulted in a peak discharge of 80,400 cfs. The dam failure hydrograph was routed downstream and the results are presented in Table 2.

The proposed dam raise has a hydraulic height of 66 ft, a WSEL of 9886 and a storage volume of 4,140 ac-ft (CDC, 1983). The regression equation predicts a peak flow of 127,400 cfs. There was one published dam failure for a reservoir located in

Castlewood, CO which had a depth of 70 ft and a storage volume of 5,000 ac-ft which resulted in a peak discharge of 126,000 cfs.

The calibrated dam breach parameters input into HEC-1 for the proposed dam raise are a maximum breach width of 198 ft, side slopes of 0:1, and a time of failure of 0.7 hrs. The resulting peak flow using the calibrated breach parameters is 136,200 cfs. The dam failure hydrograph was routed downstream and the results are presented in Table 2.

An estimated flood wave 17 ft. deep and a peak discharge of 41,100 cfs would reach the Mount Werner Water Treatment Plant on Fish Creek in 1.1 hours if there was a failure of the existing dam at normal water level. An estimated flood wave 23 feet deep and a peak discharge of 103,700 cfs in 0.9 hours would reach the same location if there was a failure of the proposed dam at normal water level.

An estimated flood wave 11 ft. deep and a peak discharge of 26,200 cfs would reach the downtown area of Steamboat Springs in 1.7 hours if there was a failure of the existing dam at normal water level. An estimated flood wave 16 feet deep and a peak discharge of 69,400 cfs in 1.2 hours would reach the same location if there was a failure of the proposed dam at normal water level.

A map showing the estimated flood inundation limits for the Town of Steamboat Springs resulting from a dam failure of the proposed dam raise is shown on Drawings 1 and 2. The map used for Figure 1 does not extend from the Mt. Werner Water Treatment Plant upstream to the Fish Creek Dam. It is WCC's understanding that there are no permanent structures in this reach of stream. The base map does not extend downstream on the Yampa River from the confluence of Fish Creek and does not extend on the west side the Yampa River near Riverside Drive. The flood inundation map shown has been extrapolated in both of the areas from the U.S.G.S. map.

Studies and analyses for this report were performed by John Sikora, under the direction of Dan Johnson, Project Manager. Dr. John Andrews reviewed and approved this report. Information was provided by Mr. Dan Birch of the City of Steamboat Springs.

Opinions and analysis for the Fish Creek dambreak are presented in this report. They are based partly on technical analysis and available information, partly on our understanding of site conditions and partly on our general experience with projects of a similar nature.

Woodward-Clyde warrants that our services are performed within the limits prescribed by our Clients, with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended in our proposals, contracts or reports.

If you have any questions regarding the dambreak analysis please do not hesitate to call.

Sincerely,

John W. Andrew
Associate

Daniel C. Johnson
Principal

JHS:art

(1 copy sent)

1c: Dan Birch, City Engineer, Town of Steamboat Springs
File

TABLE 1

FLOW-FREQUENCY AND FEMA FIS RESULTS
U.S.G.S. GAGE STATION FREQUENCY ANALYSIS RESULTS

Return Period (yrs)	Fish Creek @ Mt. Werner WTP (cfs)	Yampa River @ 5th St. Bridge (cfs)
500	1050	6420
100	960	5870
50	920	5590
10	810	4730
5	750	4230

FEMA FLOOD INSURANCE STUDY RESULTS

Return Period (yrs)	Fish Creek @ Mt. Werner WTP (cfs)	Yampa River @ 5th St. Bridge (cfs)
500	4,600	20,000
100	1,800	8,000
50	1,400	6,500
10	1,100	5,300

TABLE 2

RESULTS OF DAMBREAK ANALYSIS FOR FISH CREEK RESERVOIR

Location	Existing Dam WSEL @ 9866			Alternative Dam Raise @ WSEL 9875			Proposed Dam Raise @ WSEL 9886		
	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)	Peak Flow (cfs)	Peak Depth (ft)	Time[1] (hrs)
Fish Creek Downstream of Dam	63,200	12	0.9	80,400	13	0.7	136,200	16	0.7
Fish Creek @ Mt. Werner Water Treatment Plant	41,100	17	1.1	61,300	19	0.9	103,700	23	0.9
Fish Creek @ Highway 40	35,000	20	1.3	52,700	23	1.0	89,200	28	1.0
Yampa River @ 2nd Street	26,200	11	1.7	41,200	13	1.3	69,400	16	1.2
Yampa River @ 7th Street	25,800	11	1.7	40,500	13	1.3	68,100	16	1.2
Yampa River @ Riverside Dr.	20,800	10	1.9	33,900	11	1.5	56,900	13	1.4

[1] Cumulative time from beginning of dam failure.

APPENDIX G

COLORADO WATER CONSERVATION BOARD STIPULATION

STATE OF COLORADO

COLORADO WATER CONSERVATION BOARD

Department of Natural Resources

721 State Centennial Building
1313 Sherman Street
Denver, Colorado 80203
Phone (303) 866-3441
FAX (303) 866-4474

July 20, 1993

Roy Romer
Governor

Dorles C. Lile P.E.
Director, CWCB

Ms. Wendy Schmitzer
U.S. Forest Service
Routt National Forest
29587 West U.S. 40
Steamboat Springs, CO 80487

RE: Case No. 6-92CW023; City of Steamboat Springs, Fish Creek Reservoir Enlargement

Dear Ms. Schmitzer:

I am writing at the request of the City of Steamboat Springs to advise you of the status of the Donation Agreement contemplated by the Colorado Water Conservation Board's settlement with Steamboat Springs in the above-referenced water court case.

As you know, the Board filed a statement of opposition to the City's application for a 200 AF enlargement of Fish Creek Reservoir. To resolve the Board's concerns, the Board and City entered into a stipulation in November 1992 which provided for donation of the 200 AF to the Board for maintenance of instream flows downstream in Fish Creek.

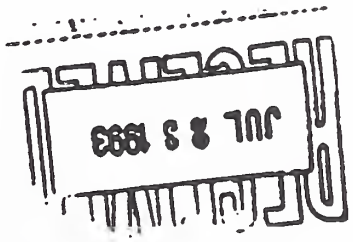
While the Donation Agreement has not yet been finalized, it will contain the following specific terms:

1) A provision allowing Steamboat to use the 200 AF for municipal purposes in the event of a water supply emergency or severe drought.

2) A term which designates Steamboat Springs as an agent of the Board for the purpose of administering releases of the donated water.

3) A term limiting the donation to 200 AF.

The Board staff has been in contact with Steamboat's representatives and expects to have a draft agreement prepared for the Board's consideration at its November 1993 meeting.



If you have any questions about the status of the Donation Agreement, or if I can be of further assistance, feel free to contact me.

Sincerely,

Dan Merriman (amj)

Dan Merriman, Chief
Water Right Investigations
Section

cc: Dan Birch
John Fetcher

/amj
\corresp\fisher.doc

City of
Steamboat Springs

January 27, 1993

Ms. Wendy Schmitzer
Routt National Forest Supervisors Office
Riverside Center
Steamboat Springs, CO 80487

Dear Wendy:

This letter outlines the City of Steamboat Springs' (City) and Mount Werner Water and Sanitation District's (District) commitment to utilize 200-acre-feet of the proposed 2200 acre-feet enlargement of Fish Creek Reservoir for instream flow. This is in accordance with the commitment already made to the Colorado Water Conservation Board (CWCB), the sole entity by state statute that may hold an instream flow right in Colorado.

The City and Mount Werner will reserve and store within the enlarged Fish Creek reservoir 200 acre-feet of water, the primary purpose of which will be to augment the CWCB instream flow right of 2.0 cfs on Fish Creek for the reach below the water filtration plant intake to the confluence with the Yampa River. The City and District agree to release up to the 200 acre-foot volume in any year in order to satisfy the 2.0 cfs requirement for the reach.

The 200 acre-feet will be reserved and used exclusively for instream flow purposes except in the event of severe drought or water emergency such that no other source of storage water is available to meet municipal demands of the City and District.

The City and District agree to monitor stream flow and call for administration of the stream by the Division Engineer of the Colorado Department of Natural Resources to ensure storage water released for instream flow purposes is not diverted by other water users on the subject reach.

Sincerely,

CITY OF STEAMBOAT SPRINGS

Daniel R. Birch
City Engineer/Assistant Utilities Director

cc: John Fetcher, Mount Werner Water and Sanitation District
Jean Ray, ACZ

P.O. Box 775088, Steamboat Springs, Colorado 80477
City Hall - 879-2060; Utility Accounting - 879-6993; Police - 879-1144; Public Works Shop - 879-1807
Steamboat Springs Airport - 879-9042; Transit - 879-5585; FAX: 303-879-8851

DISTRICT COURT, WATER DIVISION NO. 6, COLORADO

Case No. 92CW023

STIPULATION

CONCERNING THE APPLICATION FOR WATER STORAGE RIGHTS OF THE CITY OF STEAMBOAT SPRINGS

IN ROUTT COUNTY, COLORADO

The Applicant, the City of Steamboat Springs ("City"), and the objector, the Colorado Water Conservation Board ("CWCB"), by and through their respective attorneys, hereby stipulate as follows:

1. In this case, the City seeks a decree for a conditional water storage right of 200 AF for the proposed enlargement of Fish Creek Reservoir, in Routt County.

2. The CWCB holds instream flow water rights decreed in Case No. W1371-77 on Granite Creek for 4 cfs and in Case No. W1372-77 for 2 cfs on Middle Fork of Fish Creek, both with appropriation dates of September 23, 1977.

3. The CWCB has objected to the application of the City, claiming that the decree sought herein will injure the said CWCB instream flow water rights if the City stores 200 AF of water in an enlargement to Fish Creek Reservoir under a decree which may be granted in this case.

4. The City disputes the CWCB claim.

5. For the purpose of resolving the controversy between the City and the CWCB in this case, the City and CWCB agree that the Court may enter a conditional decree for the water right applied for in this case in accordance with the application, provided that such decree shall contain the following conditions and provisions:

(a) No water shall be stored in the Fish Creek Reservoir enlargement pursuant to the decree in this case until and unless the City and the CWCB have entered into and executed a donation contract or agreement, approved by appropriate resolution of both the City and the CWCB.

(b) The City will use reasonable efforts to construct additional habitat improvement structures in Fish Creek downstream from the Mt. Werner Pipeline intake prior to the storage of water in Fish Creek Reservoir enlargement under the decree in this case, subject to

obtaining access permission from riparian landowners and obtaining all necessary governmental permits to do so, provided that the cost of such additional improvements (including the value of in-kind services provided thereto) shall not in any event exceed $10,000.00 (adjusted to account for inflation), less the cost and in-kind value of the habitat improvements already made by the City in Fish Creek in 1991.

(c) The above provisions of (a) and (b) shall be conditions and limitations on the 200 AF of water decreed to the City in this case, and shall run with the ownership of such water right and be binding upon the City and its successors and assigns to such right.

6. The City shall provide the CWCB with a copy of any proposed decree to be submitted to the Court in this case, and any such proposed decree shall incorporate the terms of paragraph 5 above. The CWCB shall not oppose any such decree that is consistent with the terms and conditions contained in paragraph 5 above. In the event the application in this case is tried to the Court, the City agrees to seek a decree with terms no less protective of the CWCB and the instream flows in Fish Creek than the stipulation and agreement described in paragraph 5 above.

7. The CWCB agrees that it will not object to any decree that contains terms and conditions at least as restrictive on the City as those contained in this stipulation, and further agrees that such a decree may be entered by the Court in conformance with the application and this stipulation, irrespective of the Statement of Opposition by the CWCB.

DATED this 31st day of December, 1992.

SHARP AND BARNEY

Thomas R. Sharp #0722
401 Lincoln Ave
P.O. Box 774608
Steamboat Springs, CO 80477

Telephone 303-879-7600

FOR THE ATTORNEY GENERAL

Steven O. Sims #9961
Assistant Attorney General
Natural Resources Section
1525 Sherman Street, 5th Floor
Denver, CO 80203
Telephone 303-866-5129

APPENDIX H

CITY & MT. WERNER METERING RATES

ORDINANCE NO. 1331

AN ORDINANCE AMENDING CHAPTER 25 OF THE MUNICIPAL CODE TO PROVIDE FOR METERED WATER AND WASTEWATER (SEWER) RATES; ESTABLISHING THE REQUIREMENT FOR METER INSTALLATION; PROHIBITING THE TAMPERING WITH OR BY-PASSING OF METERS; AND PROVIDING FOR OTHER MATTERS IN RELATION THERETO

WHEREAS, the City Council desires to adopt a consistent water and wastewater rate structure based upon actual use; and

WHEREAS, the demand placed upon the water and wastewater utility systems of the City by any single consumer can best be measured by metering water consumption; and

WHEREAS, a rate structure based upon actual use will promote and encourage conservation.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF STEAMBOAT SPRINGS:

Section 1. Chapter 25 of the of the Steamboat Springs Municipal Code shall be amended by the addition of eight new sections which read as follows:

25-54 METERS REQUIRED

All premises using the city water supply must be equipped with a water meter and appurtenances furnished by the city at the cost of the consumer; provided however that water may be supplied during construction at a flat rate before installation of a water meter as set forth in section 25-75 below. Before any premises are occupied, a water meter and appurtenances shall be installed therein as hereinafter required or no water shall be furnished such premises. Residents unmetered on the date of the adoption of this ordinance shall pay the penal water service rate of one-hundred fifty dollars ($150.00) a month for water service and the penal wastewater service rate of one-hundred dollars ($100.00) a month until a water meter is installed by the consumer at the consumer's cost, but should a meter not be installed within ninety (90) days of the adoption of this ordinance service shall be discontinued and the water disconnected.

25-55 METER INSTALLATION

Meters and appurtenances shall be installed in a manner and location acceptable to the Public Works Department.

25-56 OWNERSHIP; THEFT

The city shall retain ownership of all meters and appurtenances, including those installed at customer expense.

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No person shall remove a water meter without the approval of the City Manager and unauthorized removal of a meter shall constitute theft.

25-57 METER MAINTENANCE

The Public Works Department shall maintain, test, and repair all meters as required, however the property owner shall be responsible for the cost of all repair including repair, testing and replacement caused by freezing. Additionally, the property owner shall be responsible for the removal and replacement of any heat tape, insulation, or similar protective product prior to maintenance of the meter or its replacement. The cost of repair may be added by the Finance Director to the charge for water service. Any municipal water meter shall be tested upon complaint of the consumer upon payment of a fee of thirty ($30.00) dollars. If upon test the meter is not within three (3%) percent of being accurate, it shall be repaired or replaced and the fee returned to the consumer.

25-58 INTERFERING WITH OR BY-PASSING WATER METERS

No person shall tamper or interfere with any water meter or meter seal or appurtenances or so arrange or have water service or piping so that the use of water will not actuate the meter. The City Manager shall discontinue water service to any consumer who violates the provisions of this section until satisfactory payment has been made for all water used, all repairs to the meter or appurtenances, all repairs to correct the bypass and all fees for terminating and resuming water service.

25-59 RIGHT OF ENTRY

Any city employee, upon proper identification and prior reasonable notice, shall have the right to enter any property, premises or building where water is used for the purposes of (1) installation of a water meter and appurtenances; (2) making an inspection of pipes, meters, fixtures, appliances and appurtenances which are related to the installation, maintenance and or reading of the water meter; (3) reading the meter; and (4) for the purposes of detecting and eliminating violations of this ordinance. The property owner shall be responsible for maintaining suitable access to the meter and appurtenances for the purposes set forth in this section. The City Manager shall discontinue water service to any consumer who refuses to grant entry pursuant to the provisions of this section until satisfactory compliance is obtained, and all fees for terminating and resuming water service are paid. Nothing herein shall be construed as in anyway limiting the right of such employee to (1)apply for a search warrant pursuant to the Colorado Municipal Court Rules and the Steamboat Springs Revised Municipal Code and/or

(2)make emergency inspections pursuant to same.

25-75 CONSTRUCTION SERVICE

During the construction of any building and before any water meter is installed as is herein provided, the contractor so constructing such building may be permitted to use the city water supply by making application therefor, and paying the flat fee of thirty ($30.00) dollars per month. Construction water usage shall not exceed six months from the date of connection and may be revoked at anytime by the Public Works Director, with or without cause.

25-76 YARD HYDRANTS AND IRRIGATION ONLY ACCOUNTS

A residential or commercial customer may by application have additional account(s) for irrigation only or yard hydrants. Separate irrigation and yard hydrants must be metered in accordance with the provisions of this chapter and such accounts will be charged service charges and quantity charges as described elsewhere in this chapter.

Section 2. Section 25-216 of the Steamboat Springs Municipal Code shall be amended to read as follows:

(a) Each water consumer shall be billed for water service on a monthly basis for each dwelling unit or commercial structure as set forth below.

(b) Charges for water service shall consist of a monthly service charge, as provided in subsection (c) below, and a quantity charge, as provided in subsection (d) below. Additionally, charges for water service may consist of additional surcharges as set forth in section 25-222.

(c) Each residential water consumer shall pay a monthly service charge of eleven dollars and seventy-five cents ($11.75) and each commercial water consumer shall pay a monthly service charge of sixteen dollars and fifty cents ($16.50).

(d) Each residential water consumer shall pay a monthly quantity charge calculated as follows: one dollar ($1.00) per 1,000 gallons for the number of gallons used from 1,000 gallons to 12,000 gallons ("block 1"); and one dollar and fifty cents ($1.50) per 1,000 gallons for the number of gallons used from 13,000 gallons to 20,000 gallons ("block 2"); and two dollars ($2.00) per 1,000 gallons for the number of gallons used from 21,000 gallons to 28,000 gallons ("block 3"); and three dollars ($3.00) dollars per 1,000 gallons for the number of gallons used in excess of 28,000 gallons. Each commercial water consumer shall pay a monthly quantity charge calculated as follows: one dollar and seventy-five

cents ($1.75) per 1,000 gallons. Where meters cannot be read, account billings may be estimated.

Section 3. Section 25-223 (a) of the Steamboat Springs Municipal Code shall be amended to read as follows:

(a) The monthly charges for water service to a private dwelling, apartment, condominium unit or any other single-family dwelling unit occupied by a family meeting the eligibility criteria established below shall be discounted to one-half of the service charge, as set out in section 25-216(c), no discount shall be given for volume usage. The rate charged for turning water on to these same units shall be discounted to one-half of the regular rate, as set out in section 25-216. Nothing stated herein shall be construed as allowing a discount for wastewater service charges. The wastewater rate shall be as set forth in section 25-218, with no rate discounts. For purposes of this section, the terms "dwelling unit" and "family" shall be defined as set forth in section 17-62.

Section 4. Section 25-223 (b) of the Steamboat Springs Municipal Code shall be amended to read as follows:

(b) Discount rates will take effect in the month following initial application to the city. The discount rate for families eligible under the elderly criteria shall remain in effect until discontinuation of service, a change in the name of the billing, or any change in the status of the family or dwelling, which affects eligibility for the discount. The discount rate for families eligible under the nonelderly criteria will remain in effect for one year; provided, that no nonelderly discount rate will remain in effect after discontinuation of service, a change in the name of the billing, or any change in the status of the family or dwelling, including discontinuation of income support payments and changes in family income, which affects eligibility for the discount. Families eligible under the nonelderly criteria may reapply yearly for continuation of the discount, and reapply to keep the discount rate in effect. Members of families receiving discount rates shall notify the city upon any change in status of the family or dwelling, which might affect eligibility for the discount.

Section 5. Section 25-223 (f) of the Steamboat Springs Municipal Code shall be amended to read as follows:

One-half of the service charge, as set out in section 25-218(d), for a private dwelling, apartment, condominium unit or any other single-family dwelling unit meeting the eligibility requirements as outlined in subsections (b), (c) and (d) of this section shall be reimbursed on a monthly basis to the customers eligible for the discount. Such rebate shall be made from the general fund of the city. Under no

circumstances will any rebate be allocated from the wastewater fund. Nothing in this section shall be construed as allowing for a discount rate for wastewater service.

Section 6. Section 25-218 of the Steamboat Springs Municipal Code shall be amended to read as follows:

(a) The purpose of this portion of the chapter is to generate sufficient revenue to pay all costs for the operation and maintenance of the complete wastewater system and to pay all capital costs for the complete wastewater system, if required. The costs shall be distributed to all users of the wastewater system in proportion to each user's contribution to the total loading of the wastewater facility. Factors such as strength (BOD and SS), volume, and delivery flow rate characteristics shall be considered and included as the basis for the user's contribution to ensure a proportional distribution of costs to each user or user class.

(b) Each wastewater user shall be billed for wastewater service on a monthly basis for each dwelling unit or commercial structure as set forth below.

(c) Charges for wastewater service shall consist of a monthly service charge, as provided in subsection (d) below, and a quantity charge, as provided in subsection (e) below. Additionally, charges for wastewater service may consist of additional surcharges as set forth in sections 25-219 and 25-222.

(d) Each residential wastewater user shall pay a monthly service charge of eight dollars and twenty-five cents ($8.25) and each commercial wastewater user shall pay a monthly service charge of thirteen dollars and fifty cents ($13.50).

(e) Each residential wastewater user shall pay a monthly quantity charge of one dollar fifty cents ($1.50) per 1,000 gallons based on the average indoor consumption of water calculated as the amount of water supplied by the city water system as shown by the water meter readings for the months, as determined by the City Manager, which best estimate average indoor water consumption. Each commercial wastewater consumer shall pay a monthly quantity charge calculated as follows: one dollar and fifty-five cents ($1.55) per 1,000 gallons of water supplied by the city water system as shown by the water meter readings for the month of billing. New accounts or summer only accounts shall have charges estimated based on first month readings and other information available to the Finance Director. Commercial wastewater users may appeal to the Finance Director for application of an average winter consumption or, an average summer

consumption, or other suitable estimate if the user can show that billing based on current water use will result in unfair treatment a gross injustice. In all cases in which users of said wastewater system are not supplied with water from the city water system, the charge for use of the wastewater system shall be determined by the City Manager.

Section 7. Section 25-222 of the Steamboat Springs Municipal Code shall be amended to read as follows:

The city council has determined that there exists a reasonable basis for the assessment of higher rates to consumers outside of the city limits. This basis relates to the fact that consumers within the city limits pay a property tax mill levy for water and wastewater services which consumers outside of the city limits do not. Therefore an additional monthly charge (surcharge) equal to three dollars and fifty cents ($3.50) for water service and two dollars and fifty cents ($2.50) for wastewater service shall be added to each account for each property or dwelling unit served by the city system outside the corporate limits of the city. This additional out-of-city assessment shall be billed and collected in the same manner as the monthly user charges for water and wastewater service as set forth in this chapter, except that this additional assessment will continue even though service has been temporarily disconnected. Nothing herein shall be construed as an obligation of the city to furnish water or wastewater service to any property outside the corporate limits of the city, and such surcharge shall be in addition to the normal monthly service charges and any connection charges heretofore or hereafter required. Since this additional charge is in lieu of property tax payment, city council, may from time to time, by amendment, adjust such assessment to reflect changes in city property tax rates.

Section 8. Section 25-217 of the Steamboat Springs Municipal Code shall be amended to read as follows:

(a) Every water user shall pay to the city an administrative fee of fifteen dollars ($15.00) on each occasion when a change of party's to be billed is requested, except there shall be no such fee in the case where a new service has been established subsequent to the payment of the tapping charges established by section 25-201 or when a turn-on fee is required and paid per section 25-217(b).

(b) Every water user shall pay to the city the sum of twenty-five dollars ($25.00) for every time the water is turned on and/or is disconnected, except that there shall be no such charge in the case where a new tap is being installed or for pipeline repairs or initial construction. For the purposes of this section, water service shall be deemed to have been turned on either upon the completion of the physical act of

turning on the water supply or upon the initiation of billing for water charges. Nothing contained in this section shall be construed to relieve the owner from payment of the tapping charges established by section 25-201.

(c) In addition to the sum set forth above, every water user shall pay to the city a deposit equal to the sum of the two highest months of usage within the last twelve months to turn on water service when the water was disconnected due to non-payment or delinquency. Such deposits may be applied by the city to future charges, or shall be refunded to the property owner after one-year of continuous timely payment.

Section 9. Section 25-224 of the Steamboat Springs Municipal Code shall be amended to read as follows:

The Charges established in this division shall be due and payable monthly, upon receipt. Accounts shall be deemed delinquent if payment is not received by the City within fifteen (15) days of the billing date. Accounts in arrears more than thirty (30) days shall bear interest at the rate of one percent per month until paid. Accounts in arrears more than sixty (60) days shall be posted for disconnection and charged a penalty of fifteen dollars ($15.00) unless suitable arrangements have been made with the Finance Director for payment in full.

Section 10. Section 25-39 of the Steamboat Springs Municipal Code shall be amended to read as follows:

The director of public works may grant permission to any person employed by the city, or to any other person the city manager may authorize, to draw water from the fire hydrants. The fee for personal use of such water shall be the commercial quantity charge as specified in section 25-216(d), plus wages for the person who operates the hydrant, based on the operator's regular hourly wage and the length of time for such operation and supervision of such drawing of water.

Section 11. Section 25-223(e) of the Steamboat Springs Municipal Code shall be amended by deletion in its entirety as follows:

~~Reimbursement of charges for hospital facilities. Forty (40) percent of the quarterly charges for water and sewer service to Routt County Memorial Hospital and the Steamboat Springs Hospital Association Extended Care Center shall be reimbursed on a quarterly basis from the general fund of the city. In no event shall any rebate be allocated from the water or sewer fund.~~

Section 12. Safety Clause. The City Council hereby finds, determines and declares that this ordinance is necessary for the immediate preservation of the public peace, health and safety.

Section 13. Severance Clause. If any section, subsection, sentence, clause, or phrase of this Ordinance is, for any reason held to be invalid, such decision shall not effect the validity of the remaining portion of this Ordinance.

INTRODUCED, READ AND ORDERED published, as provided by law, by the City Council of the City of Steamboat Springs, at it's regular meeting held on the 2nd day of March, 1993.

Mary T. Brown

MARY T. BROWN, President
Steamboat Springs City Council

ATTEST:

Deborah J. Carey

DEBORAH J. CAREY, City Clerk

FINALLY READ, PASSED AND APPROVED this 6th day of April, 1993.

Mary T. Brown

MARY T. BROWN, President
Steamboat Springs City Council

ATTEST:

Deborah J. Carey

DEBORAH J. CAREY, City Clerk

Mt. Werner Water & Sanitation District

6 November 1992

Dear Customer:

On 1 January 1993 the Mt. Werner Water and Sanitation District will switch from a flat rate charge to metered water service to encourage conservation and to comply with Colorado law. This move could very well delay the capital expense of expanding the water filtration and sewage treatment plants.

The flat or base rate for an Equivalent Residential Unit (ERU), including condominiums, will change from $8 to $10 per month for water. According to plan, each ERU will receive 10 cubic meters (CM) per month or 30 CM per quarter for the base rate of $30 per quarter (1CM = 264 gallons.) Water use over 30 CM will be billed at $0.25 per CM, which equals $0.95 per 1000 gallons. Please notice the figures at the top left of your statement. They represent your previous reading, current reading and the cubic meters used for 3rd Quarter 1992 (July, August, September). Water usage for apartments or condominiums with several meters are on the enclosed sheet.

For example, if a single family residence (ERU) usage is 50 CM, the charge for water for that quarter would be $30 flat rate plus $5 = $35. The $5 charge is calculated as follows: (50 CM - 30 CM) x $0.25 = $5.00. The sewer charge will be $30 per quarter. In spite of the planned increase your charges for water and sewer service will be, in most cases, the lowest in the state for comparable districts.

The good news is that the District's outstanding bonds were paid off in April and as a result the 1.44 mill levy will be eliminated in 1993. This will reduce your real estate tax by an amount equal to 0.00144 times your assessed valuation.

Because the District, now and in the past, bills the flat rate in advance, you will not receive a bill for the first quarter of 1993 until April when we start billing retroactively under metered service.

MT. WERNER WATER AND SANITATION DISTRICT

John R. Fetcher

John R. Fetcher, Manager

Mailing Address:
Steamboat Springs,
Colorado 80488-0339

Phone:
(303) 879-2424

Location:
Fish Creek Filtration Plant
1175 Steamboat Blvd.

APPENDIX I

CITY COUNCIL RESOLUTION & RESERVOIR FINANCIAL PLAN

RESOLUTION NO. 92-44

A RESOLUTION FINDING AND DECLARING A PUBLIC NECESSITY AND PUBLIC PURPOSE IN THE ENLARGEMENT OF FISH CREEK RESERVOIR; TO AUTHORIZE SUCH ENLARGEMENT AS A JOINT PROJECT WITH JOINT OWNERSHIP BY THE CITY AND THE MOUNT WERNER WATER AND SANITATION DISTRICT AND TO AUTHORIZE A COST SHARE FOR SUCH ENLARGEMENT WITH THE MOUNT WERNER WATER AND SANITATION DISTRICT.

WHEREAS, the City of Steamboat Springs, Colorado is the owner of the existing Fish Creek Dam and Reservoir with an active capacity of 1843 acre-feet; and

WHEREAS, the Mount Werner Water and Sanitation District needs and desires to obtain a source of storage water in the Fish Creek Basin where they presently have none; and

WHEREAS, the Mount Werner Water and Sanitation District wishes to enlarge the existing reservoir by 2200 acre-feet and wishes to have the City participate in the costs and share in the additional supply of storage water so created; and

WHEREAS the Mount Werner Water and Sanitation District by Resolution dated August 7, 1992 has authorized financing of the enlargement in an aggregate amount not to exceed $4,630,000.00 with the Colorado Water Resources and Power Development Authority ("Authority"); and

WHEREAS the City has a 2,000 acre foot conditional water right on Fish Creek Reservoir decreed in 80 CW 255 in District Court for Water Division NO. 6 on April 30, 1981, for which a Diligence Decree was entered by the Court in 85 CW 44 on August 8, 1985 and 89 CW 39 on December 7, 1989; and

WHEREAS the City has filed in District Court for Water Division No. 6 on June 30, 1992 in 92 CW 23 an application which is currently pending for an additional 200 acre foot conditional storage right on Fish Creek Reservoir; and

WHEREAS the conditional water rights decreed and pending reflect planning to anticipate the need for additional water supplies in a growing community; and

WHEREAS the City wishes to share the Fish Creek Reservoir conditional water rights decreed and pending with the Mount Werner Water and Sanitation District; and

WHEREAS the City has an ample supply of storage water to meet near term demands but wishes to participate in the enlargement to help meet long term water demands; and

WHEREAS the City recognizes problems with low flows on Fish Creek during certain periods of the year and wishes to utilize a portion

of the additional amount of storage water for release to augment instream flows.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF STEAMBOAT SPRINGS, COLORADO, THAT:

1. The City hereby agrees to contribute $175,000 per annum to the debt retirement of the project beginning in the year 2000 and continuing for a total of twelve years constituting a total contribution not to exceed $2,100,000; Mount Werner Water and Sanitation District to pay all remaining costs related to the expansion. The City Agreement in this paragraph is subject to the condition that Mount Werner Water and Sanitation District first agree with the City that the District will not expend borrowed funds received from the Authority net of issuance cost, until the District and/or City have obtained permits from the Army Corps of Engineers and the U.S. Forest Service, and Routt County to complete the enlargement.

2. The City recognizes that the City and Mt. Werner Water and Sanitation District will share ownership to the storage water in proportion to the amounts each contributes to fund and finance the enlargement.

3. The City Council hereby directs and authorizes the City Manager and the City Council President to discuss and preliminarily approve any agreements or documents necessary to complete the enlargement of the reservoir and financing for the enlargement. The City Council expressly reserves the right to consider and finally approve any and all such agreements and documents.

PASSED, ADOPTED AND APPROVED this 25th day of August 1992.

Mary T. Brown

MARY T. BROWN
City Council President

ATTEST:

Marty Alexandroff

Marty Alexandroff, City Clerk

FISH CREEK RESERVOIR ENLARGEMENT - FINANCIAL PROGRAM

COLORADO WATER RESOURCES AND POWER DEVELOPMENT AUTHORITY

1992 SMALL WATER RESOURCES PROGRAM - SERIES B

ar of ration	ANNUAL REVENUES: CITY OF STEAMBOAT SPRINGS Contribution & Tax Rebate	CITY OF STEAMBOAT SPRINGS O & M	MT. WERNER WATER DISTRICT Service Charge Increase Water	Sewer	Meters	City District Total	ANNUAL EXPENDITURES: DEVELOPMENT AUTHORITY LOAN 20yrs@7% 4,630,000	Emergency Reserve	O & M	TOTAL ANNUAL EXPENSE
1	200,000	10,000	82,000	82,000	105,000	479,000	248,380	3,000	10,000	261,380
2	200,000	10,000	82,000	82,000	105,000	479,000	326,767	3,000	10,000	339,767
3	200,000	10,000	84,000	84,000	107,000	485,000	400,580	3,000	10,000	413,580
4	200,000	15,000	84,000	84,000	107,000	490,000	398,980	3,000	15,000	416,980
5	200,000	15,000	84,000	84,000	107,000	490,000	401,773	3,000	15,000	419,773
6	200,000	15,000	86,000	86,000	109,000	496,000	398,770	3,000	15,000	416,770
7	200,000	15,000	86,000	86,000	109,000	496,000	400,185	3,000	15,000	418,185
8	200,000	20,000	86,000	86,000	109,000	501,000	400,735	3,000	20,000	423,735
9	175,000	20,000	88,000	88,000	111,000	482,000	400,475	3,000	20,000	423,475
10	175,000	20,000	88,000	88,000	111,000	482,000	399,375	3,000	20,000	422,375
11	175,000	20,000	88,000	88,000	111,000	482,000	397,510		20,000	417,510
12	175,000	25,000	90,000	90,000	111,000	491,000	399,860		25,000	424,860
13	175,000	25,000	90,000	90,000	111,000	491,000	401,113		25,000	426,113
14	175,000	25,000	90,000	90,000	111,000	491,000	401,237		25,000	426,237
15	175,000	25,000	92,000	92,000	113,000	497,000	400,338		25,000	425,338
16	175,000	25,000	92,000	92,000	113,000	497,000	396,398		25,000	421,398
17	175,000	25,000	92,000	92,000	113,000	497,000	400,403		25,000	425,403
18	175,000	25,000	94,000	94,000	113,000	501,000	401,030		25,000	426,030
19	175,000	25,000	94,000	94,000	113,000	501,000	400,260		25,000	425,260
20	175,000	25,000	94,000	94,000	113,000	501,000	398,250		25,000	423,250
	3700000	395000	1766000	1766000	2202000	9829000	7772419	30,000	395,000	8197419

REVISED 1

E: REVENUES FOR THE FIRST 8 YEARS IN COLUMN 1 OF $200,000 PER YEAR ARE DISTRICT FUNDS RECEIVED FROM THE CITY AS A PROPERTY TAX REBATE. STARTING IN YEAR 9 THROUGH 20, THE CITY OF STEAMBOAT SPRINGS WILL CONTRIBUTE $175,000 ANNUALLY TOWARD DEBT SERVICE.

J.R. FETC

APPENDIX J

REVISED BIOLOGICAL ASSESSMENT

REVISED
BIOLOGICAL ASSESSMENT
for the
FISH CREEK RESERVOIR EXPANSION PROJECT
on the
ROUTT NATIONAL FOREST

May 1993

Accepted by the United States Forest Service, Routt National Forest

_____ _____

Tom Fratt, Fisheries Biologist Date

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1.0 INTRODUCTION

The Endangered Species Act of 1973 (the Act) requires Federal agencies to "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." The purpose of the Act is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" and "to provide a program for the conservation of such endangered species and threatened species...."

Section 4 of the Act (Determination of Endangered Species or Threatened Species) grants the Secretary of the Interior power to determine whether any species is considered threatened or endangered, based on the present status of the species such as population numbers, limited habitat, disease, existing regulatory mechanisms, or any man-made influences jeopardizing the species' continuing existence.

Section 7 of the Act (Interagency Cooperation) specifies that, to more effectively carry out the purpose of the Act, all other Federal departments and agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities by "taking such action necessary to insure that actions authorized, funded, or carried out by them (Federal departments and agencies) do not jeopardize the continued existence of any listed species (pursuant to Section 4) or result in the destruction or modification of critical habitat of such species."

The consultation process is designed to assist Federal agencies when complying with the Act, and authority of consultation has been delegated by the Secretary of the Interior to the Director of the U.S. Fish and Wildlife Service (USFWS). The consultation process involves several phases. First, a general description of the proposed action and a formal request for a listing of proposed, candidate, and listed endangered and threatened species potentially affected by the proposed action is submitted to the USFWS by the affected agency. The USFWS responds with a list of proposed, candidate, and listed species within the proposed Project Area. When the project is a construction project, the agency then prepares a Biological Assessment which identifies the project, details the biology of listed and proposed species on the list submitted by the USFWS, analyzes the cumulative effects of the project, and determines if there is likely to be an effect (either beneficial or adverse) on any listed or proposed species. If a "may affect" determination is made, the agency must request formal consultation with the USFWS.

Formal consultation involves USFWS consideration of the proposed project and how it may affect the biology of any listed threatened or endangered species, including the magnitude of such effects and potential cumulative effects. Based on this information, a Biological Opinion is issued by the USFWS which states one of three possible conclusions: the proposed action (1) may promote the continued existence of the species, (2) is not likely to jeopardize the continued existence of the species, or (3) is likely to jeopardize the continued existence of the species. Reasonable and prudent alternatives must be addressed by the USFWS as part of the Biological Opinion when a determination is made that the proposed project is likely to jeopardize the continued existence of the species.

The USFWS, in a letter to the Routt National Forest (dated 5/19/92), provided a list of Threatened, Endangered, and Proposed Species which might occur within the influence of the

proposed Fish Creek Reservoir expansion project (Rose, pers. comm. 1992). Species referenced were five endangered species: bald eagle (*Haliaeetus leucocephalus*), Colorado squawfish (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail chub (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*). No other endangered, threatened, or proposed wildlife or plant species are expected to be affected by the proposed project. The American peregrine falcon (*Falco peregrinus anatum*) may occasionally fly near the project area during migration, but populations or habitats of this species would not be affected by the proposed project. Four Candidate (C2) species which could also be affected by reservoir expansion are not addressed by this Biological Assessment but are discussed in appropriate sections of the EIS prepared for the project.

This biological assessment addresses the Forest Service's preferred alternative for reservoir expansion and ensures compliance with the provisions of the Endangered Species Act of 1973, P.L. 93-205 (87 Stat. 884), as amended.

2.0 PROJECT LOCATION AND DESCRIPTION

The proposed project is located just west of the Continental Divide along the Park Range in north-central Colorado and would consist of increasing the storage capacity of the existing Fish Creek Reservoir. The project site is located approximately 7 air miles east of Steamboat Springs, Colorado on National Forest land under the jurisdiction of the Hahns Peak Ranger District of the Routt National Forest.

Geographically, the reservoir site lies along the upper portions of the Park Range which forms the western boundary of North Park. The area is characterized by high-elevation low, rolling, and variably broken hills and small mountain peaks dissected by generally westerly trending drainages. These drainages are primarily low volume perennial streams with their origins in high elevation wetlands. They join at various locations to form the more substantial Fish Creek which cascades down the western edge of the range until reaching the Yampa River. Elevations in the project area range from approximately 9,800 feet immediately west and downslope of the existing dam to nearly 10,000 feet on the east side of the project area.

The proposed project would involve deepening the reservoir basin in some areas and raising the existing level of the two dams by approximately 18 feet which would allow inundation of an additional 50 acres of land. At present, the reservoir occupies 90 acres and has a capacity of 1,842 acre-feet. The expansion project would provide an estimated additional 2,280 acre-feet of storage capacity. Implementation of the project would involve conventional dam construction techniques, development of new roads and borrow areas, and upgrades of existing roads within the project area.

The reservoir expansion project area occurs within the breeding range of the federally listed endangered bald eagle. None of the four federally listed endangered fish species occur on or near the project area, but the USFWS considers any action that could result in a net water depletion in the upper Colorado River Basin a negative impact to these fish species and their habitats.

3.0 RISK ASSESSMENT PROCESS

Information regarding the habitat requirements of listed species and their distribution on or near Fish Creek Reservoir was obtained by review of published literature on the biology of these species. Field surveys were conducted in September, 1992 to evaluate the potential presence of suitable habitat within the project area for listed species (Cedar Creek Associates, Inc. 1992).

The following documents were the principal information sources reviewed to assess the risk of the proposed reservoir expansion adversely affecting Threatened, Endangered, or Proposed Species.

- Bald Eagle: Green (1985), USFWS (1983)
- Colorado Squawfish: Behnke and Benson (1983), Torres et al. (1978), Tyus and Karp (1989), USFWS (1991), and Woodling (1985)
- Bonytail - Behnke and Benson (1983), Torres et al. (1978), Tyus and Karp (1989), USFWS (1990a), and Woodling (1985)
- Humpback chub - Behnke and Benson (1983), Torres et al. (1978), Tyus and Karp (1989), USFWS (1990b), and Woodling (1985)
- Razorback sucker - Behnke and Benson (1983), Torres et al. (1978), Tyus and Karp (1989), and Woodling (1985)

This Biological Assessment followed a four step process to identify threatened and endangered species potentially affected by the proposed project and evaluate impacts the project may have on those species.

1. Identification of species of concern from a list of threatened, endangered, and proposed species provided by the USFWS.
2. Review of existing information and identification of known or potential habitat on or near the project area.
3. Field reconnaissance to further refine determination of the occurrence of threatened and endangered species or potential habitat within the project area.
4. Evaluation of potential project-related impacts on threatened and endangered species or critical habitats.

4.0 SPECIES STATUS DESCRIPTIONS

4.1 BALD EAGLE (ENDANGERED)

The range of the bald eagle encompasses most of the North American Continent. Major breeding areas are associated primarily with coastal areas and large inland lakes and rivers. During the fall, thousands of bald eagles from Alaska and Canada migrate to the lower 48 states and winter there from October through March. Bald eagles occur primarily as wintering birds in Colorado, and wintering populations are known to occur along the Yampa and Colorado rivers. A few nesting records also exist for the state (Green 1985).

Historic (1930s - 1960) reductions in bald eagle reproductive success were linked to the ingestion of prey contaminated with DDT and other chlorinated hydrocarbons used extensively in pesticides (Green 1985). Human disturbance of nest sites is also considered a major factor in the reduction of reproductive success.

Habitat for bald eagles consists of secure nesting sites, diurnal perches, winter roosts, and foraging areas usually associated with large lakes or rivers. Nesting habitats preferred by bald eagles are multi-layered, mature or old-growth forest stands removed from human disturbance and in shoreline areas adjacent to open water (USFWS 1983). Important stand characteristics include large trees and snags which provide sites for nests and perches. Preferred wintering areas are usually near open water portions of major rivers or reservoirs where bald eagles feed on fish or waterfowl. However, bald eagles also will hunt over upland areas with little or no water if other food sources (e.g., rabbits or deer carrion) are readily available (Green 1985).

Late spring snow and ice cover on Fish Creek Reservoir makes the area unsuitable for nesting and obtaining prey during the early portion of the nesting season. Bald eagles may occasionally wander over the area during the winter months, but they are not expected to use the project area for any extended periods because of heavy snow cover and the fact that Fish Creek Reservoir freezes over.

4.2 COLORADO SQUAWFISH (ENDANGERED)

The Colorado squawfish is endemic to the Colorado River basin and occurred historically in Colorado, Wyoming, Utah, New Mexico, Arizona, Nevada, and California in the main stem channels of the Colorado, Gunnison, White, Yampa, Little Snake, San Juan, Dolores, Uncompahgre, Animas, Green, Duchesne, Gila, Salt, and Verde Rivers (USFWS 1991). The current distribution of this species is restricted primarily to the lower reaches of the Green, Yampa, White, Colorado, and Gunnison rivers (USFWS 1991). Adults are known to winter in the Yampa River as far upstream as Craig, Colorado.

Colorado squawfish are adapted to rivers with seasonally variable flow, high silt loads, and turbulence. Adults prefer eddies, pools, and other areas adjacent to the main current flow in big, deep water. Young squawfish inhabit quiet, shallow backwater areas off main river channels over silt and sand bottoms. Tagging and telemetry studies indicate that Colorado squawfish move long distances from spawning areas in the mainstem Green River to feeding and overwintering areas in the Yampa, White, and Duchesne rivers. These studies suggest a net upstream movement of adult and juvenile squawfish from the Green River into the Yampa

River. There also appears to be downstream movement of larval squawfish from the Yampa River to the Green River (USFWS 1991). The quantity and timing of flow from the Yampa River into the Green River has been implicated with the reproductive success of squawfish in downstream areas of the Green River. Young-of-the-year Colorado squawfish were not collected in known nursery areas in the Green River during a dry year when typical high spring flows in the Yampa River were not reached (USFWS 1991).

Limiting factors for Colorado Squawfish have been summarized by Tyus and Karp (1989) as follows. High spring flows, along with increasing water temperatures are necessary for the initiation of spawning migration. Decreasing flows and warming river temperatures in early and mid-summer are necessary for successful spawning and downstream transport of drifting larvae. Low flows in late summer and fall are correlated with availability of nursery habitat and young fish abundance and growth. A stable base-flow is necessary for maintenance of winter habitats.

Causes for the decline of the Colorado squawfish are not completely understood, but alterations in natural flow patterns due to dams and diversions are cited as contributing factors (Woodling 1985). River waters downstream of reservoirs exhibit colder water temperatures and lower sediment loads than those occurring prior to reservoir development. Also the natural cycle of spring flood and late summer drought has been replaced by stable discharges, and seasonal fluctuations are less significant than fluctuations related to variable demands for irrigation water and hydroelectric power. Channelization below dams has reduced the amount of shallow, backwater habitats preferred by squawfish for nursery and resting areas. Dams also have blocked historic migration routes. Additionally, competition with introduced, non-native fishes has been implicated in the decline of Colorado squawfish and other native species.

4.3 BONYTAIL CHUB (ENDANGERED)

Bonytail chubs were formerly found in larger river environments of the entire Colorado River basin from Wyoming to Mexico (USFWS 1990a). Until the construction of large dams, this fish was probably the most abundant species in the main river channels of the Colorado and Green rivers (Behnke and Benson 1983). Recently, bonytail chubs have only been collected from the Black Rocks area of the Colorado River near the Colorado/Utah border (Woodling 1985). Little is known of the habitat requirements of the bonytail chub, but it seems to prefer eddies and pools and avoids the swift current of main channels areas (USFWS 1990a). A radio-tracking study of adult bonytail chubs introduced into the upper Green River in 1988 and 1989 is expected to yield additional habitat use information (Tyus and Karp 1989).

Hybridization with other *Gila* species and cold water releases from dams are believed to be the primary reasons behind the decline in bonytail chub populations (Woodling 1985).

4.4 HUMPBACK CHUB (ENDANGERED)

The historical distribution of the humpback chub probably included the swift, deepwater habitats within canyon portions of the Colorado River, Green River, and two Green River tributaries, the Yampa and White rivers (USFWS 1990b). Present populations of the humpback chub in Colorado occur in the Yampa River in Dinosaur National Monument, the Green River in Dinosaur National Monument and in Desolation and Gray canyons, the Colorado River in Marble and Grand canyons and between Palisade and Black Rocks, and the mouth of the Little

Colorado River (USFWS 1990b). Greatest numbers have been found in the Black Rocks area of the Colorado near the Utah/Colorado border.

The humpback chub has been collected primarily in canyon portions of rivers characterized by fast currents and deep channels (USFWS 1990b). Adjacent shallower areas and eddies within these canyons appear to be important for adult humpbacks (Tyus and Karp 1989). Young-of-the-year prefer shallow habitats with little current over silt substrate (USFWS 1990b). As with the Colorado squawfish, spring peak flows are important to the reproductive success of humpback chub because spawning occurs in shoreline eddy habitat shortly after peak runoff (Tyus and Karp 1989). The extent of suitable spawning habitat is greatest during spring runoff and is reduced rapidly with decreasing summer flows.

Causes for this species' decline have been linked to reductions in flow, cold water releases from dams, hybridization with other *Gila* species, and competition with introduced species (Tyus and Karp 1989).

4.5 RAZORBACK SUCKER (ENDANGERED)

Historically the range of the razorback sucker was similar to that of the Colorado squawfish, large river habitats in the Colorado River basin from Mexico to Wyoming. In Colorado the razorback sucker has recently only been found in the lower, mainstem Colorado, Gunnison, Yampa, and Green rivers (Woodling 1985). In the upper Colorado River basin, razorback suckers disappeared from the Green River above the mouth of the Yampa River after the completion of Flaming Gorge Dam and the release of cold water (Behnke and Benson 1983).

The razorback sucker is a large river species found in habitats with strong currents and backwater areas. Spawning of razorback sucker has been documented in the lower Yampa River and the upper Green River below the mouth of the Yampa River. Spawning individuals were captured over cobble and gravel bar substrates during the period of increased flow associated with the highest spring runoff (Tyus and Karp 1989).

Reasons for the decline of this species are not fully understood. Reproductive failure due to dam and diversion related changes in water temperature, flows, and channel characteristics are believed to be contributing factors (Woodling 1985). Documented predation of razorback sucker young and eggs by non-native fish species such as carp and catfish has also been cited as a contributing factor (Behnke and Benson 1983).

5.0 DETERMINATION OF EFFECTS

5.1 BALD EAGLE

The proposed expansion of the Fish Creek Reservoir Would Not Affect bald eagles or important habitats. No bald eagle nesting habitat or suitable foraging areas exist in the vicinity of the project area. Suitable bald eagle winter habitat exists along the Yampa River and wintering birds could occasionally wander near the project area. However, high elevation, in combination with heavy snow cover and the lack of open water in the reservoir during the winter months, preclude any bald eagle winter use of the project area.

5.2 ENDANGERED FISH SPECIES

5.2.1 General

Since none of the four endangered fish species occur on Routt National Forest lands, there would be no direct project impacts on populations of these species. Indirect impacts could result, however, from downstream changes in flow regimes or water depletion to the mainstem Yampa River. The USFWS believes that major causes for the decline of the four endangered fish species include the effect of impoundments and water depletion from the Colorado River and its tributaries.

5.2.2 One-Time Conservation Pool Depletion

The enlarged reservoir would include a conservation pool one quarter of the size of the enlarged reservoir, or 1,030 acre-feet (AF) of water. Water releases would be controlled so that a minimum of 1,030 AF would be maintained in the reservoir. This would result in a one-time depletion of water released into Fish Creek of 1,030 AF.

5.2.3 Annual Depletion

An increase in reservoir size from approximately 90 surface acres to 140 acres would increase evaporative water losses from the reservoir in the future. Based on an estimate of evaporative water losses ranging from 45 to 150 AF per year for the existing reservoir, evaporative water losses would increase to a range of approximately 70 to 230 AF per year for the enlarged reservoir. These ranges are based on estimates of evaporative water losses of 6 to 20 inches per year for the project area; however, no site-specific data are available for the site.

Projected future increased consumption of water in the Steamboat Springs area will also decrease the amount of water available from the Fish Creek drainage to the Yampa and Colorado rivers. This decrease includes depletion on direct Fish Creek flow and will eventually occur whether or not Fish Creek Reservoir is expanded. Domestic water consumption is expected to increase from 130 AF/year in 1993 to 250 AF/year in 2013, and 465 AF/year in 2033. Loss of water through irrigation evapo-transpiration would increase from 165 AF/year in 1993 to 310 AF/year in 2013 and 580 AF/year in 2033.

Using the worst-case water consumption values indicated above, water depletion in the Fish Creek drainage would be expected to increase from 445 AF/year in 1993 to a maximum of 790

AF/year in 2013 and 1,275 AF/year in 2033 (see Table 1). The maximum depletion of 790 AF/year in 2013 and 1,275 AF/year in 2033 would be reduced by 200 AF/year to 590 AF/year in 2013 and 1,075 AF/year in 2033, with implementation of the preferred alternative for expansion of the Fish Creek Reservoir since 200 AF of water per year would be reserved for preserving minimum instream flows. As a result of a minimum instream flow agreement between the City of Steamboat Springs and the Colorado Water Conservation Board, 200 AF of the proposed reservoir expansion would be reserved for maintaining a minimum instream flow of at least 2 cfs in lower Fish Creek.

TABLE 1
ANNUAL DEPLETION
(AF/Year)

	1993	2013	2033
Evaporative Loss	45-150	70-230	70-230
Domestic Consumption	130	250	465
Irrigation Evapotranspiration	165	310	580
	340-445	630-790	1115-1275

5.2.4 Alteration In Flow Regime

Enlargement of the Fish Creek Reservoir would result in minor reductions in the release of water into Fish Creek and, correspondingly, into the Yampa River during the spring fill (100-day) period. Based on the expanded reservoir size of 4,122 AF, which includes a conservation pool of 1,030 AF, a worst-case scenario for annual reservoir refill would be approximately 3,100 AF of water which would require a diversion of 15.5 cfs during the 100-day spring runoff period. This reduction in flow represents 0.44% of the flow at the Maybell gaging station on the Yampa River where the river flow averages 3,500 cfs during the 100-day runoff period (15.5 cfs/3,500 cfs = 0.44%). The worst-case scenario for reservoir refill of the existing reservoir is approximately 1,800 AF of water, requiring diversion of 9 cfs of water during the spring fill period (or 0.26% of the flow in the Yampa River at Maybell). The reservoir expansion would, therefore, result in a 0.18% (0.44% - 0.26%) change in flow in the Yampa river at Maybell during the 100-day runoff period.

Following the spring fill period, flows released into Fish Creek for the remainder of the year would be more consistent. More consistent releases would result from greater control over releases through the redesigned outlet structure, remote operator control of the outlet, and a minimum instream flow agreement. As a result of the minimum instream flow agreement discussed above, 200 AF of the proposed reservoir expansion would be reserved for maintaining a minimum instream flow of at least 2 cfs in lower Fish Creek.

5.2.5 Cumulative Impacts

The cumulative impacts of reservoir storage to flows in the Yampa River are addressed in the Yampa River Basin Alternatives Feasibility Study (Hydrosphere, March 1993) which is included as Attachment A. the study indicates that present depletion in the entire basin amounts to approximately 100,000 AF/year. This is approximately 7% of the total flow of 1.5 million AF/year on the lower Yampa. It is anticipated that future basin depletions will amount to approximately 150,000 AF/year or 10% of the total flow (see attached report).

5.2.6 Conclusion

Because expansion of Fish Creek Reservoir would result in a depletion of spring water releases into the Upper Colorado River basin, and cause minor alterations in flow regimes to the Yampa River, it has been determined that the proposed action **May Affect** downstream populations of the Colorado squawfish, humpback chub, bonytail chub, or razorback sucker.

6.0 REFERENCES CITED

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ATTACHMENT A

YAMPA RIVER BASIN ALTERNATIVES FEASIBILITY STUDY

APPENDIX K

PROJECT MITIGATION

FISH CREEK RESERVOIR MITIGATION

July 23, 1993

1.0 SHORT-TERM CONSTRUCTION/POST CONSTRUCTION MITIGATION

Overall goals and objectives:

- Minimize impacts to Forest users and visitors.
- Minimize environmental impacts using best management practices. More specific Forest Service best management practices will be incorporated into construction/operation plans prior to approval.
- Provide for an orderly and efficient progression of work.

1.1 General Construction Plan

Permittee shall provide a conceptual plan for review and approval addressing at a minimum the following:

- General construction schedule.
- Erosion control and water quality monitoring.
- Traffic control including signage, plan to minimize trips generated for the project, dust control, and Forest Road maintenance.

Permittee's contractor shall prior to start of construction provide a detailed plan for review and approval addressing at a minimum the following:

- Specific construction schedule including specific tasks, daily and weekly work schedules, and construction sequencing.
- Construction site safety and security.
- Explosives handling and use.
- Noise control.
- Dust abatement.
- Construction site layout including man-camp, office/laboratory facilities, equipment storage, fuel storage, and material storage.

1.2 Forest Service Construction Oversight

Permittee shall reimburse Forest Service for field personnel necessary for construction oversight.

1.3 Powerline

- Permittee shall submit separate operating plan for powerline construction including construction access, staging, preconstruction erosion control, and fire plan among others.
- See Visuals regarding powerline cubicles.
- Powerline alignment outside roadway shall be staked and reviewed and approved by the Forest Service prior to construction. Loss of trees shall be minimized.
- Prior to construction in the roadway, the existing roadbase material shall be stripped, stockpiled, and reused upon backfill of the excavation.

1.4 Water Quality

The overall goals and objectives for water quality are to maintain to the maximum extent practical using best management practices the pristine nature of the water leaving the reservoir site into the Puppy Dog Lake and Fish Creek drainages and creeks and to monitor the base line condition of the creeks and their condition during construction.

Permittee's contractor shall prior to start of construction provide a detailed plan for review and approval addressing at a minimum the following:

- Spill prevention and response.
- Care and control of water including diversions, dewatering, and gravel washing facilities.
- Erosion and sedimentation control per CDOH and Forest Service requirements.
- Stream water quality monitoring.

1.5 Transportation

The overall goals and objectives for transportation are to minimize traffic impacts and maximize travel safety.

Permittee's contractor shall prior to start of construction provide a detailed plan for review and approval addressing at a minimum the following:

- Construction site travel routes.
- Dust control and abatement.
- Forest Road maintenance.
- Spill prevention and response.

The transportation plan shall include the following specific mitigation:

- Mobilization of heavy equipment to the site will utilize West Route from Dry Lake Campground to the reservoir site. The road shall be closed during mobilization or appropriate traffic control such as pilot vehicles shall be used as necessary.
- Supply trucks may only travel to the site on weekdays during daylight hours.
- Approved signage will be provided at the base and top of of Buffalo pass indicating supply truck and equipment may be encountered.
- Mobilization of equipment to the site will use pilot vehicles as may be required by State or local laws.
- Mobilization of equipment through town shall be done so as to avoid travel from 7:00 a.m. to 8:30 a.m. and from 3:00 p.m. to 6:00 p.m.
- Supply truck and heavy equipment shall use City Route 1 (Amethyst) as defined in Section 3.10 of the EIS.
- If a man-camp is not utilized, a shuttle or shuttles for workers shall be provided. The old gravel parking lot located approximately one mile below Dry Lake Campground on the Buffalo Pass Road may be used for worker parking.
- Precautions shall be taken so that any imported road material does not contain noxious weeds.
- All temporary roads shall be reclaimed.
- Concrete shall be batched onsite.

During construction activities, permittee shall be responsible for County road repair and maintenance in accordance with the Letter of Understanding dated June 16, 1993, and approved by the County Commissioners, a copy of which is attached and incorporated to this document by reference.

For Forest Service roads used for construction traffic to the site, during construction activities, Permittee shall be responsible for

dust control, periodic grading and maintenance of the roadbase material, and drainage repair, including roadside ditches and culverts. On certain portions of the road between Dry Lake Campground and Buffalo Pass, Permittee shall add roadbase to those parts of the roadway without an adequate roadbase.

1.6 Recreation

- Signage shall be provided per the Forest Service to alert recreationists on both sides and the top of Buffalo Pass regarding the construction at the reservoir and direct them to other sites.

- Permittee shall undertake a program of media notification.

- Contractor's personnel may not use other campgrounds or dispersed camping areas. Contractor's activities shall be confined to the work area defined in the construction plans.

1.7 Visual Resources

- Buildings: Final siting and design will be approved by the Forest Service. Colors will be per Forest Service Region II color standards.

- Road Corridor I as defined in the EIS will be utilized. Road will be located so as to minimize cut and fill. Forest Service will approve all final road alignments prior to construction.

- Revegetation: All ground disturbance shall be revegetated within 5 days of construction.

- Borrow Area A will be confined to below the proposed high water level. Use of Borrow Areas B and C will require specific Forest Service authorization. If used these areas must be reclaimed and revegetated and restored to provide natural appearing topography.

- The man-camp and construction staging area shall be located below the proposed high water line. The existing picnic ground may be utilized. Approved Forest Service fencing shall be used to delineate and screen the man-camp and staging area.

- Clearing: Tree clearing shall be minimized for all features including the dams, roads, campground, and powerline. Edges of tree clearing shall be feathered. Forest Service will approve all flag-lines prior to clearing.

- Spillway: Cut slopes in bedrock shall have a broken-faced appearance. Cut-slopes will blend to match natural contours. The low-flow channel will have a natural appearance.

- Power cubicles shall meet Forest Service Region II color standards and be screened to meet Forest Service Visual Quality Objectives. Field locations to be reviewed and approved by Forest Service prior to construction.

- Construction debris will be removed from the site between construction seasons and at the end of construction.

- Use of night lighting shall be minimized.

1.8 Vegetation

- See revegetation notes under Visual Resources.

1.9 Soil

- Wetlands and upland soils shall be segregated, stock piled and used for wetlands mitigation sites and upland revegetation.

2.0 LONG TERM MITIGATION

2.1 Dam Safety/Flood Hazard

- Emergency response plan shall be updated to incorporate the EWADAS (Early Warning and Automatic Data Acquisition) system.

2.2 Water Resources

- Compensation for water depletions shall be paid to USFWS.

- Puppy Dog Lake Drainage: Existing eroded areas will be stabilized by physical means using log structures and hand grading. Disturbed areas will be revegetated. Reservoir Operating Plan will be revised to state flows exceeding 20 cfs will not be routed over spillway. Drainage will be monitored and additional stabilization, revegetation, and changes to Operating Plan will be made as necessary. Stream reach inventory will be completed prior to construction and will be updated yearly until it is demonstrated the channel has stabilized.

- The permittee shall endeavor to maintain at all times a minimum pool of 1000 acre-feet in the reservoir. If, in the sole discretion of the permittee without need of

approval by the Colorado Division of Wildlife, the U.S. Forest Service, or other Federal or State agency, the permittee deems the water is necessary to meet the municipal demands of Steamboat Springs, the water may be released in part or in its entirety. In this event the permittee shall replace or reimburse the Division of Wildlife for the loss of any gamefish resulting from the draw-down.

- o 200 acre-feet shall be dedicated to the Colorado Water Conservation Board for instream flows on Fish Creek below the intake at the water filtration plant.

2.3 Socioeconomic

- o Water Conservation Plan (suggested mitigation).
- o Water system master plan defining service area (suggested mitigation).

2.4 Wetlands

- o Wetland loss will be mitigated per Forest Service and COE. Subject to COE approval, offsite mitigation will be preferred over onsite mitigation which disturbs undisturbed areas and creates impacts which do not meet Forest Service visual objectives.
- o No work shall proceed which disturbs wetlands until a 404 Permit is received.

2.5 Vegetation

- o Revegetated sites will be monitored and additional revegetation made as necessary.
- o Permittee shall submit a noxious weed control plan.

2.6 Wildlife/Fisheries

- o Permittee shall coordinate with DOW to restock the reservoir as soon after it is filled as possible.

2.7 Recreation

- o Permittee shall build the campground at the proposed site in conformance with the conceptual plan in the Final EIS. Permittee shall finalize plans for the campground Summer, 1993, for Forest Service approval. The campground shall be completed no later than the final season of reservoir construction.
- o To minimize visual impacts of reservoir draw-down during the recreation season, Permittee will not draw-down the

reservoir by more than six (6) vertical feet during the period June 1 to October 1 of any year. The six feet of draw-down includes two feet of estimated draw-down for instream flow releases.

Permittee and Forest Service recognize that with time the amount of draw-down may increase because of increased municipal water demands. It is anticipated that the six feet of required draw-down will meet demands anticipated until the year 2003. Eight feet of total draw-down, including releases for instream flow, will be necessary through the year 2013.

Forest Service recognizes that draw-downs in excess of the above amounts may be made in emergency conditions and for maintenance and repair purposes.

2.8 Transportation

- Service roads, including their appurtenant drainage facilities shall be upgraded to meet Forest Service standards.

- Permittee shall modify Operation Plan to reflect post-construction road maintenance.

- Permittee shall submit road relocation plan for portion of road inundated by reservoir expansion. (This is part of the reservoir construction plans.)

Mt. Werner Water & Sanitation District

16 June 1993

Routt County Commissioners
P.O. Box 3598
Steamboat Springs, CO 80477

RE: Letter of Understanding regarding Amethyst, Strawberry Park Road (CR 36), Buffalo Pass Road to Dry Lake Campground and Fish Creek Reservoir Construction Maintenance

Dear County Commissioners:

This Letter of Understanding specifies the areas of maintenance and repair responsibility of the Mt. Werner Water and Sanitation District for the above referenced roads related to construction activity and traffic impacts for the enlargement of Fish Creek Reservoir.

AMETHYST

Amethyst will be used as access rather than the Ledge Road. Mt. Werner will be responsible for repair of any pavement sections on Amethyst that fail due to construction traffic.

STRAWBERRY PARK ROAD

This covers the portion of Strawberry Park Road from Amethyst to Buffalo Pass Road. The existing condition of this road is poor and the County will be performing repairs this Spring. The County Engineer will review with Mt. Werner the repair plans and will review with Mt. Werner the road upon completion of the repairs. The intent of the County's work effort will be to repair all sections that are failing or have already failed.

Mt. Werner will be responsible for repairs due to construction traffic of any repaired section or any section the condition of which was sound prior to start of construction.

BUFFALO PASS ROAD

Mt. Werner will be responsible for repair of any pavement sections that fail due to construction traffic.

Mt. Werner will be responsible for dust control, periodic grading, and drainage repair and maintenance of the gravel portion of the road to Dry Lake Campground during construction activities. Dust control includes application of chemical agents.

Mailing Address:
Steamboat Springs,
Colorado 80488-0339

Phone:
(303) 879-2424

Location:
Fish Creek Filtration Plant
1175 Steamboat Blvd.

TIMING/SCHEDULE

Construction may occur during the 1993 and 1994 construction seasons or may be delayed or extended to include 1995. It is possible construction may not begin in 1993.

LIMITATION

Mount Werner will not be responsible for repairs not caused by construction traffic, nor will Mount Werner be responsible for maintenance when construction is not underway.

Mount Werner may contract independently for the maintenance and repair or, subject to County approval, reimburse the County for their maintenance and repair.

Your signatures below indicate your approval and acceptance of this Letter of Understanding.

Sincerely,

MOUNT WERNER WATER AND SANITATION DISTRICT

John R. Fetcher 16 June '93

John R. Fetcher, Secretary and General Manager

ROUTT COUNTY COMMISSIONERS

By: D. Dennis Fisher

Dennis Fisher

Nancy J. Stahovrak

Nancy Stahovrak

Ben Beall

Ben Beall

City of
Steamboat Springs

August 5, 1993

Mr. John F. Toolen
Colorado Division of Wildlife
711 Independent Avenue
Grand Junction, CO 81505

RE: Fish Creek Reservoir Fishery

Dear John:

Upon completion of the reservoir enlargement the City and Mount Werner will reimburse the Division of Wildlife (DOW) for its costs to restock the reservoir. In addition, upon completion of the project if it is necessary for the City and Mount Werner to release all or part of the 1030 acre-foot fisheries pool because of drought conditions, an emergency, or necessary repairs or maintenance, the City and Mount Werner will pay for any game fish restocking needed as the result of such a draw-down.

Unless we or the Forest Service hear from you to the contrary, we will assume these terms and conditions are acceptable.

Sincerely,

CITY OF STEAMBOAT SPRINGS

Daniel R. Birch
City Engineer/Utilities Director

MOUNT WERNER WATER AND SANITATION DISTRICT

John R. Fetcher
General Manager

cc: Wendy Schmitzer, USFS

P.O. Box 775088, Steamboat Springs, Colorado 80477
City Hall - 879 2060; Utility Accounting - 879-6993; Police - 879-1144; Public Works Shop - 879-1807
Steamboat Springs Airport - 879 9042; Transit - 879 5585; FAX: 303 879-8851

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GLOSSARY



GLOSSARY

acre-foot (AF)
The amount of water which covers an acre of land to a depth of one foot; equal to 325,827 gallons.

ACHP
Advisory Council on Historic Preservation

ADT
Average daily traffic. Measured as a one-way trip (a round-trip is two one-trips).

affected environment
A physical, biological, social, and economic environment within which human activity is proposed.

alluvium
Material, including clay, silt, sand, gravel, and mud, deposited by flowing water.

alternatives
A choice of two or more things; for NEPA purposes alternatives to the Proposed Action must be examined in an EIS. The discussion of alternatives must "sharply [define] the issues and [provide] a clear basis for choice...by the decision maker and the public." (40 CFR 1502.14).

ambient
The environment as it exists at the point of measurement and against which changes (impacts) are measured.

animal unit month (AUM)
The amount of forage required by one cow and one 6-month old calf, or their equivalent, for one month. Approximately 1,000 pounds of air-dried feed.

aquatic
Growing, lining in, frequenting or taking place in water; in this EIS, used to indicate habitat, vegetation and wildlife in freshwater.

anthesis
The period or act of expansion of flowers.

aquifer
A zone, stratum or group of strata acting as a hydraulic unit that stores or transmits water in sufficient quantities for beneficial use.

available water capacity
Capacity of a soil profile for storing water in a form available to plants.

background
(Visual distance zone.) The distant part of a landscape. The seen or viewed area located from 3 to 5 miles to the horizon from the viewer.

base flow
A sustained or fair-weather flow of a stream.

berm
An earthen structure, generally several feet high, which acts as a barrier to make it difficult for a vehicle to cross, or which redirects the flow or traffic or water.

Best Management Practices (BMP)
Management actions that are designed to maintain water quality by preventative rather than corrective means.

big game
Large animals hunted, or potentially hunted, for sport.

biomass
The amount (weight or mass) of living material.

biota
All of the living material in a given area; often refers to vegetation.

BOD
Biological Oxygen Demand - The quantity of oxygen utilized in the biochemical oxidation of organic matter in a specified time and temperature.

borrow area
Rock quarry; earthen construction material source area such as sand and gravel or topsoil taken from specific area for use in construction or reclamation.

Bureau of Land Management (BLM)
The agency of the United States Government, under the Department of the Interior, responsible for administering the public lands of the United States.

carrying capacity
The maximum population number that can be sustained under existing conditions.

CDWR
Colorado Division of Water Resources

CEQ
Council on Environmental Quality - A body established by the National Environmental Policy Act (NEPA) to draft regulations for implementing and monitoring NEPA.

CFR
Code of Federal Regulations.

cfs
Cubic feet per second, 1 cfs equals 448.33 gallons per minute.

CGS
Colorado Geological Survey

chronically
Continually and repeatedly over a long period of time.

City
City of Steamboat Springs, Colorado

CNAO
Colorado Natural Areas Office

COE
U.S. Army Corps of Engineers

coarse fragments
That portion of the soil larger than 2mm including gravels, cobbles, rocks and boulders.

colluvial
Soil material that has moved downhill and has accumulated on lower slopes and at the bottom of a hill consisting of alluvium in part and also containing angular fragments of the original rocks, i.e. cliff and avalanche debris.

colluvium
Soil material or rock fragments moved down slope by gravitational force in the form of creep, slides, and local wash.

Colorado
State of Colorado

contrast
The effect of striking difference in form, line, color, or texture of a landscape's features.

Commissioners
Routt County Commissioners

County
Routt County

cover
Living or non-living material (e.g., vegetation) used by fish and wildlife for protection from predators, to ameliorate conditions of weather, or reproduce: The proportion of the ground occupied by a perpendicular projection to the ground from the outline of the aerial parts of the members of a plant species.

criteria
Date and information which are used to examine or establish the relative degrees of desirability among alternatives or the degree to which a course of action meets an intended objective.

CRWCD
Colorado River Water Conservation District

cumulative impacts
Combined impacts of the past, present and reasonable foreseeable future actions. For example, the impacts of a proposed timber sale and the development of a mine together result in cumulative impacts.

CWCB
Colorado Water Conservation Board

DEIS
Draft Environmental Impact Statement, see EIS.

demography
A statistical study of the characteristics of human populations with reference to size, density, growth, distribution, migration and effect on social and economic conditions.

density
The number of individuals in a given area. Expressed per unit area.

depletion
Use of water in a manner that makes it no longer available to other users in the same system.

direct impacts
Impacts which are caused by the action and occur at the same time and place.

discharge
The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, million gallons per day, gallons per minute, or cubic meters per second.

diversion
Removing water from its natural course or location, or controlling water in its natural course or location, by means of a ditch, canal, flume, reservoir, bypass, pipeline, conduit, well, pump, or other structure or device.

diversity
An expression of community structure. High if there are many equally abundant species; low if only a few equally abundant species.

DOW
Colorado Division of Wildlife

earthquake
Sudden movement of the earth resulting from faulting, volcanism, or other mechanisms within the earth.

edaphic
Pertaining to soils.

effects
"Effect" and "impact" are synonymous as used in this report. Direct or primary impacts are those caused by the project and occur at the same time and place. Indirect, or secondary, effects are those that result from the project that occur later in time or farther removed in distance or time, but are still reasonably forcibly.

EIS
Environmental Impact Statement - Means a detailed written statement as required by section 12(2)(C) of the National Environmental Policy Act (40 CFR 1508.11). An analytical document prepared under the National Environmental Policy Act (NEPA) that portrays potential impacts to the human environment of a Proposed Action and its possible alternatives. An EIS is developed for use by decision makers to weigh the environmental consequences of a potential decision.

endangered
Any species which is in danger of extinction throughout all or a significant portion of its range.

environment
The physical conditions that exist within the area that will be affected by a proposed project, including land, water, minerals, flora, fauna, and objects of historical or aesthetic significance. The area involved shall be the area in which significant effects would occur either directly or indirectly as a result of the project. The "environment" includes both natural and man-made conditions.

EPA
Environmental Protection Agency.

ephemeral stream
A stream or portion of a stream that flows only in direct response to precipitation. Such flow is usually of short duration.

epicenter
The part of the earth's surface directly above the focus or origin, of an earthquake.

erosion
The wearing away of the land surface by running water, wind, ice or other agents.

°F
Degrees Fahrenheit

FAC
Facultative Plants: plants with a similar likelihood of occurring in uplands or wetlands (33 to 67%)

FACU
Facultative Upland Plants: plants which sometime occur in wetlands but occur most often (67 to 99%) in uplands.

FACW
Facultative Wetland Plants: plants which sometimes occur in uplands but occur most often (67 to 99%) in wetlands.

fan
Rock and soil material deposited at the toe of a slope by the action of fluvial and gravitational forces.

fault
A displacement of rock along a sheer surface.

feasible
Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

fines
Fine particulate matter; specifically particles less than 4.0 mm in diameter.

fishery
All activities related to human harvest of a fisheries resource.

flaggy
A term describing a soil texture indicating the presence of flat coarse fragments form 5 to 38 cm long.

floodplain
Low land and relatively flat areas joining streams, rivers, and lakes which are periodically inundated by overbank flows of water.

fluvial
Of or relating to a stream or river.

forb
Broad-leafed, small plants composed of soft tissue; not woody material.

foreground
(Visual distance zone.) a term used in visual management to describe the area immediately adjacent to the observer, usually within 1/4 to 1/2 mile.

Forest Service
USDA Forest Service

Forest Supervisor
Routt National Forest Supervisor

form
The mass or shape of an object, which appears unified; often defined by edge, outline, and surrounding space.

frequency
The number of samples in which a plant or animal species occurs divided by the total number of samples.

geomorphic
Pertaining to the form of the surface of the earth.

geotechnical
A branch of engineering that is essentially concerned with the engineering design aspects of slope stability, settlement, earth pressures, bearing capacity, seepage control, and erosion.

glacial drift
Glacial materials deposited directly by ice with little or no transportation by water.

gpd
Gallons per day.

gpm
Gallons per minute.

grade
A slope stated as so many feet per mile or as ft/ft (%).

groundwater
Water found beneath the land surface,in the zone of saturation below the water table.

growth media
All materials; including topsoil, specified soil horizons, vegetative debris, and organic water, which are classified as suitable for stockpiling and reclamation re-topsoiling.

habitat
The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions.

hazardous waste
A waste is considered hazardous by the EPA if it exhibits one or more of these characteristics; ignitability, corrosivity, reactivity, toxicity. These are listed in 40 CFR 261.3 and 40 CFR 171.8.

heterogeneous
Not uniform in structure or composition.

hydraulic conductivity
A measure of the ability of rock or soil to permit the flow of ground water under a pressure gradient; permeability.

hydrologic system
All physical factors, such as precipitation, stream flow, snowmelt, ground water, etc., that effect the hydrology of a specific area.

ID Team
Interdisciplinary Team - The interdisciplinary team is comprised of personnel who collectively represent two or more areas of specialized technical knowledge about natural resources management applicable to the area being planned. The team will consider problems collectively, rather than separate concerns along disciplinary lines. This interaction will ensure systematic, integrated consideration of physical, biological, economic, and other sciences.

impermeable
Property of a substance that inhibits passage of fluids through its mass.

impoundment
The accumulation of any form of water in a reservoir or other storage area.

incized
A narrow, steep-walled valley caused by erosion.

increment
The amount of change from an existing concentration or amount; such as air pollutant concentrations

indigenous
Originating, developing, or produced naturally in a particular land, region, or environment; native.

indirect impacts
Impacts which are caused by the action and are later in time or farther removed in distance, but are still reasonable foreseeable.

inert
A substance that is chemically unreactive; not effecting any substance it comes in contact with.

infiltration
The movement of water or some other fluid into the soil through pores or other openings.

infiltration galleries
Horizontal wells utilized to collect alluvial groundwater; for the City and Mt. Werner, the infiltration galleries (which they sometimes call well fields) are utilized as a back-up water supply.

infrastructure
The underlying foundation or basic framework; substructure.

intermittent stream
A stream that does not contain water year-round

interstitial
Occupying the spaces between sediment particles.

isothermal
Having equal temperatures.

jurisdictional wetland
A wetland area delineated and identified by specific technical criteria, field indicators and other information for purposes of public agency jurisdiction. The public agencies which administer jurisdictional wetlands are the Fish and Wildlife Service, Army Corps of Engineers, Environmental Protection Agency and the Soil Conservation Service.

key viewpoint
The point(s) commonly in use or potentially in use where the view of a management activity is the most disclosing. The location which provide the means of studying the visual impact of alternatives to the landscape.

landform
A natural landscape that exists as a result of wind, water, or geologic activity.

landscape
The sum total of the characteristics that distinguish a certain area on the earth's surface from other areas. These characteristics are a result not only of natural forces but of human occupancy and use of the land.

lead agency
The public agency that has the principal responsibility for carrying out or approving a project.

line
The path that the eye follows when perceiving abrupt differences in form, color, or texture. In the landscape, ridges, skylines, structures, changes in vegetation, or individual trees and branches may be perceived as line.

lineament
A topographic line that is structurally controlled (faults, jointing, etc.). Lineaments are studied especially on aerial photographs.

lithic
Made from stone, particularly as applied to the production and manufacture of stone tools.

long-term impacts
Impacts that result in permanent changes to the environment.

management area
An area of land used in planning that consists of similar analysis areas, has one prescription assigned, and may not be contiguous.

middleground
(Visual distance zone.) The space between the foreground and the background in a picture or landscape. The area from 1/2 to 3 to 5 miles from the viewer.

migratory
Moving form place to place, daily or seasonally.

minimum in-stream flow
A set amount of water to be maintained in a water course for the purpose of reasonably maintaining the environment.

mitigation measure
There are several meanings of mitigate: Avoid the impact by not taking action. Minimize the impact by limiting the degree of magnitude of the action and its implementation. Rectify the impact by repairing, rehabilitating, or restoring the affected environment. Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action. Compensate for the impact by replacing or providing substitute resources, or by enhancing the value of an adjacent existing environment.

modification
A visual quality objective meaning man's activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

monitoring
A watching, observing or checking, in this instance, a continuing testing of specific environmental parameters and of project waste streams for purposes of comparing with permit stipulations, pollution control regulations, mitigation plan goals, etc.

MOU
Memorandum of Understanding.

Mt. Werner
Mt. Werner Water and Sanitation District

multiple use
The management concepts under which National Forest lands are managed. It involves the management of resources in combinations that will best serve the public.

National Forest
Routt National Forest

NEPA
The National Environmental Policy Act of 1969 - National charter for protection of the environment. It establishes policy, sets goals and provides means for carrying out the policy. 40 CFR 1500-1508 are the regulations for implementing the act.

NEPA Process
All measures necessary to comply with the requirements of section 2 and Title I of NEPA.

NPDES
National Pollutant Discharge Elimination System - A program authorized by sections 318, 402 and 405 of the Clean Water Act, and implemented by regulations 40 CFR 122. NPDES program requires permits for the discharge of pollutants from any point source into waters of the United States.

OBL
Obligate Wetland Plants: plants which almost always occur (99%) in wetlands.

parent material
Unconsolidated organic and inorganic mineral material in which soils form.

partial retention
A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

percolation/infiltration
The act of water seeping or filtering through the soil without a definite channel.

permeability
The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.

pH
Symbol for the negative common logarithm of the hydrogen ion concentration (acidity) of a solution. The pH of 7 considered neutral. A pH number below 7 indicates acidity and a pH value above 7 indicates alkalinity or a base.

physiography
A description of the features and phenomena of nature.

piezometer
A device for measuring moderate pressures of liquids.

PMF
Probable Maximum Flood - A statistically determined flood event.

point source
Stationary sources of potential pollutants. In terms of mining, some examples of point sources are crushing and screening equipment, conveyor and pond outlet pipes.

pollution
Human-caused or natural alteration of the physical, biological, and radiological integrity of water, air, or other aspects of the environment producing undesired effects.

porosity
The percentage of the bulk volume of rock or soil that is occupied by interstices, whether isolated or connected.

potable water
Suitable, safe, or prepared for drinking.

potentiometric surface
Surface to which water in an aquifer would rise by hydrostatic pressure.

prehistoric
relating to the times jus preceding the period of recorded history.

priority pollutant
Toxic aqueous pollutants specified as a particular concern in the Clean Water Act; EPA sets limits for discharge of these pollutants.

pristine
Pertaining to pure, original, uncontaminated conditions.

probable maximum flood
See PMF.

project
The whole of an action, which has a potential for resulting in a physical change in the environment.

Proposed Action
A description of the project as proposed by the project proponent in the Special Use Permit application.

PRVs
Pressure Reducing Valves

public scoping
Giving the public the opportunity for free, unhampered, speaking or writing concerning the intentions, activity, or influence of a project on the community, environment, personal, or anything relative.

raptor
Bird of prey, including eagles, hawks, falcons, and owls.

RCC
roller compacted concrete

RCRA
Resource Conservation and Recovery Act

recharge
Absorption and addition of water to the zone of saturation.

reclamation
Returning disturbed land to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

Reclamation Plan
A document that details the specific measures to be taken by the project proponent to reclaim the project lands during construction and after prject completion.

resident
A species, which is found in a particular habitat for a particular time period (i.e. winter resident, summer resident, year-round) as opposed to those found only when passing through on migration.

residuum
Soil material formed by rock weathering in place.

richter scale
A numerical (logarithmic) measure of earthquake intensity.

rills
A channel or groove made by a small stream.

riparian
A type of ecological community that occurs adjacent to streams and rivers. It is characterized by certain types of vegetation, soils, hydrology and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

riprap
a layer of large, broken rock placed together irregularly to prevent erosion of embankments, causeways, or other surfaces.

ROD
Record of Decision - A document which discloses the decision on a major federal action and the reasons why the decision was made.

ROS
Recreational Opportunity Spectrum - Used in describing potential recreational uses of an area.

runoff
Precipitation that is not retained on the site where it falls, not absorbed by the soil; natural drainage away from an area.

RVD
Recreation Visitor Days

safety factor
A safety factor is a ratio of resisting forces to driving forces. By determining a structure's safety factor, a numerical index of stability is obtained.

scenic quality
The degree of harmony, contrasts, and variety within a landscape; the overall impression retained after driving through, walking through, or flying over an area of land and/or water.

scoping
The procedures by which the Led Agencies identifies the issues and determines the extent of analysis necessary for the Environmental Impact Statement

sedentary organisms
Not migratory; staying in one place; stationary.

sediment
Material suspended in liquid or air; also, the same material once it has been deposited.

sediment basin
A pond, depression, or other device used to trap and hold sediment.

sediment loading
The mass of solid erosion products deposited by or carried in water or air.

sediment trap
A facility (e.g., an excavation basin or pond) or quiet water where suspended particulates can settle to the bottom, reducing sediment transport downstream.

seismicity
The likelihood of an area being subject to natural earthquakes; the relative frequency, magnitude, and kind of natural earthquakes.

sensitive species
A plant or animal listed by the State or Federal agency as being of environmental concern; includes but is not limited to threatened and endangered species.

sensitivity level
A particular degree of measure of viewer interest in and concern for the scenic quality of the landscape.

seral
Of, relating to, or characteristic of an ecological sere (a series of ecological communities that follow one another in the course of the biotic development of an area or formation from pioneer stage to climax).

settling ponds
Structures constructed by excavation and/or by building an embankment whose purpose is to retain water and allow for settlement of fines (TSS) and reduction in turbidity.

SHPO
State Historic Preservation Office

short-term impacts
Impacts occurring during project construction and operation, and ceasing upon project closure reclamation.

significant effect
A substantial,or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, water, minerals, flora, fauna, and objects of historic or aesthetic significance.

significant issues
Of all the issues and concerns raised during the scoping process for an environmental impact statement, certain of those issues are determined to be "significant" by the lead public agency. Determining which issues are significant, and thus meriting detailed study in the EIS, is the final step of the scoping process and varies with each project and each location.

siltation
The deposition or accumulation of silt or unconsolidated very fine grained soil particles.

slumping
Sliding of a mass of unconsolidated sediment down-slope. The sediment moves as a unit mass and often becomes a turbidity flow. Slumping may be triggered by slope instabilities or by earth movements.

soil horizon
A layer of soil material approximately parellel to the land surface differing fromn adjacent genetically related layers in phgysical, chemical and biological properties.

soil productivity
The natural capacity of a soil to produce a specified plant or sequence of plants under a specified system of management.

soil profile
A vertical section of the soil through all its horizons and extending into the parent material or to a depth of 60 inches.

solid waste
Garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting form industrial, commercial, mining, and agricultural operations, and from community activities.

Spill Prevention and Response Plan
A contingency plan for avoidance of, containment of and response to hazardous materials spills or leaks.

Special Use Permit
Forest Service Special Use Permit

stereoscopic
the process of viewing an object from tow locations to produce a three dimensional image, especially when a stereoscope is used to view aerial photograph pairs.

streamflow
The discharge (flow of water) in a natural channel.

stream gradient
The rate of fall or loss of elevation over the physical length of a segment or total stream usually expressed in feet per foot (%)

succession
Changes in the plant communities composing an ecosystem as the ecosystem evolves from one type to another, e.g. wetlands becoming grassy meadows.

sunk costs
Past costs; money already spent

synchronous
Recurring or operating at exactly the same periods.

taxonomy
The science of the classification and arrangement, according to relationships, of living organisms.

TDS
Total dissolved solids - As it applies to sediments in streams.

terrestrial
Of or relating to the earth, soil, land; an inhabitant of the earth or land.

texture
The visual manifestation of the interplay of light and shadow created by variations in the surface of an object.

third-party contractor
An independent firm contracted by a government agency to perform work related to a proposed action of another organization; due to the financial and contractual arrangements governing such relationships, the third-party contractor has no financial or other interest in the decision to be reached on the project.

threatened species
A wildlife species officially designated by the Fish and Wildlife Service as having its existence threatened.

topography
A configuration of a surface including its relief.

transect
A long strip or belt of terrain in which all individuals are counted and measured.

transmissivity (coefficient of)
A measure of the ability of an aquifer to transmit water.

TSS
Total suspended solids, as it applies to sediments in streams.

turbidity
Reduced water clarity resulting from the present of suspended matter.

unavoidable effects
Many effects which could occur from the project can be eliminated or minimized by management requirements and constraints and mitigation measures. Effects that cannot be eliminated are identified as unavoidable.

UPA
Obligate Upland Plants: plants which almost always occur (99%) in uplands.

underflow
Movement of water through subsurface material.

understory
A foliage layer lying beneath and shaded by the main canopy of a forest.

USDA
United States Departmemnt of Agriculture

USFWS
United States Fish and Wildlife Service - United States Department of Interior.

USGS
United States Geological Survey.

UYWCD
Upper Yampa Water Conservancy District

variety class
A rating system that classifies the landscape into different degrees of variety. This determines those landscapes which are most important and those which are of lesser value from the standpoint of scenic quality.

visual absorption capability
The physical capacity of a landscape to screen proposed development and still maintain its inherent visual character.

visual management system
The system devised by the USFS in the early 1970's to incorporate visual values into their forest management system. It involves classifying landscapes, determining visual objectives, understanding how much change a landscape can absorb, and mitigating impacts so that visual quality objectives are met.

visual management objectives
Objectives identified by the Forest Service for management of viewsheds.

visual quality objective
Degree of acceptable alteration of the natural landscape. and used by the Forest Service in classifying visual resources of an area.include retention, partial retention, modification.

visual resources
The Forest service manages viewsheds as a resource, establishing specific management objectives for different areas of Forest Service land.

visual sensitivity levels
A three-level rating system used to delineate areas receiving different amounts of exposure (present or potential) to user groups with differing attitudes towards changes in scenic quality. When combined with distance zones and variety class, make up visual quality objectives.

water filtration plant
A water treatment facility that filters water to produce potable water which meets the requirements of the Safe Drinking Water Act.

watershed
The entire land area that contributes water to a particular drainage system or stream.

weathering
The process whereby larger particles of soils and rock are reduced to finer particles by wind, water, temperature changes, and plant and bacteria action.

weir
A device (as a notch in a dam) for determining the quantity of water flowing over it from measurements of the depth of water over the crest or sill, and known dimensions of the device.

wetlands
Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, etc.

wilderness
Land designated by Congress as a component of the National Wilderness Preservation System.

WQCD
Colorado Department of Health - Water Quality Control Division

YVEA
Yampa Valley Electric Association

404 Permit
Section 404 or the Clean Water Act specifies that anyone wishing to place dredged or fill materials into the waters of the United States and adjacent jurisdictional wetlands shall apply to the U.S. Army Corps. of Engineers for approval. A permit issued by the Corps. of Engineers for these activities is known as a 404 permit.

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REFERENCES

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